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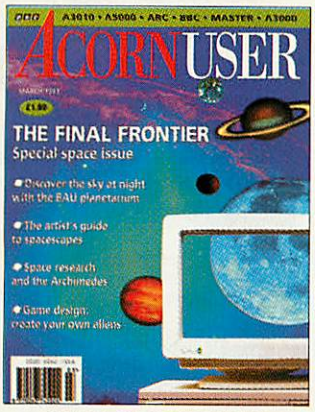
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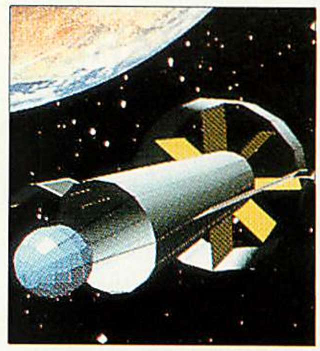
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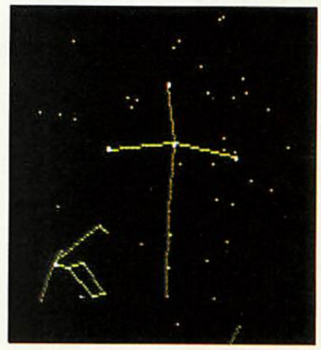
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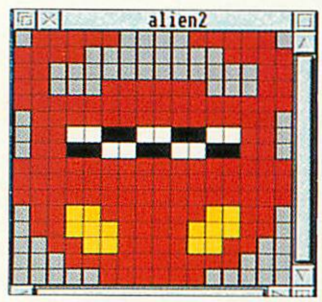
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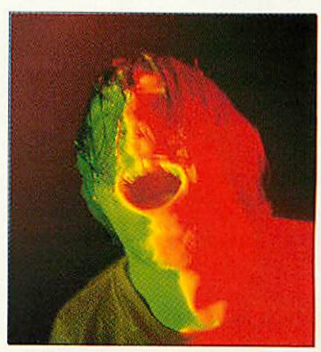
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WindowEd	Armen	£27
Words and Pictures	Chalksoft	£18
WordWorks	CC	£38
Wordz	Colton	**£95**
World Championship Boxing Manager	Krisalis	£18
World Geography Maps, draw	Micro Studio	£23
World Map Study, age 7-16	ESM	£42
Worldscape	Leading Edge	£17
World Wildlife, sprites	Micro Studio	£16
Worra Battle	Oak	£15
WorraCAD	Oak	£83
X-Fire	Fourth Dim	£18
Yacht 1	Computer Tutorial	£49
Yacht 7	Computer Tutorial	£94
Zarch	Superior	£14
Zelanites (not OS 3)	Micro Power	£15

HARDWARE

MEMORY . . .

Fitting extra unless otherwise stated
† Fitting easy ‡ Fitting needs expertise

A3000 2 Mb Non-upgradable †	IFEL	£41
A3000 2 Mb Upgradable †	IFEL	£45
A3000 4 Mb †	Atomwide/IFEL	£110
A3010 1-2 Mb		£49
A310 2 Mb Upgradable soldered ‡	IFEL	£88
– as above + MEMC1a		£124
– as above + MEMC1a + fitting		£154
A310 4 Mb soldered + MEMC1a ‡	IFEL	£180
– as above + fitting		£210
A5000 2-4 Mb Non-upgradable †	Atomwide	£85
A5000 2-4 Mb Upgradable †	IFEL	£85
A5000 2-8 Mb including fitting	Atomwide	£500
A5000 4-8 Mb including fitting	Atomwide	£391
A540 4 Mb †	Atomwide	£POA

ICS

051-625 1006

COMPUTERS . . .

A3010 1MB FD Family Solution	Acorn	£420

Family Solution + ideA

Special price when you buy an A3010 with an ICS internal hard disc upgrade:

– Family Solution + 20 Mb hard disc	£599
– Family Solution + 60 Mb hard disc	£699
– Family Solution + 80 Mb hard disc	£759
– Family Solution + 120 Mb hard disc	£859

A3010 2MB FD Learning Curve with Monitor	Acorn	£675
– as above + JP150 Printer		£889
A3020 2MB FD	Acorn	£749
A3020 2MB HD60	Acorn	£899
A4 2MB FD	Acorn	£1395
A4 4MB HD60	Acorn	£1695
A4 4MB HD80	Acorn	£1795
A4 4MB HD120	Acorn	£1895
A4 Extra Battery Pack	Acorn	£50
A4 Shoulder Bag	Acorn	£35
A4000 2MB HD80	Acorn	£945
– as above + Home Office		£995
A5000 2MB HD80 Multiscan	Acorn	£1395
– as above + Learning Curve		£1455
Pocket Book	Acorn	£212

MISCELLANEOUS. . .

386 PC Expansion Card 25 MHz	Aleph One	
– 1 Mb		£374
– 4 Mb		£468
486 PC Expansion Card	Aleph One	
– 1 Mb		£463
– 4 Mb		£557
4-slot 4-layer Backplane	IFEL	£57
9060S Monitor	Eizo	£450
A300/400 Fan kit	ICS	£15
A310 RISC OS Carrier Board ‡	IFEL	£21
A5000 Fitting Kit for second hard disc	ICS	£15
Arckey Function KeyStrip Holder	ICS	vo £3
– pack of 4		vo £10
ArcNET	ACS	£69
ARM3 ‡	Aleph One/IFEL	£175
ColourCard	CC	£238
Dongle Dangle with screw fittings	ICS	£6
Fan filters (pack of 10) (not A5000)	ICS	£6
FaxPack	CC	£289
Floppy Discs, 10 × 3½" High Density		£10
G8 Plus	State	£238
G8 Plus Video Switch	State	£23
G8 Professional	State	£348
HiPoint Mouse for A4	Genius	£49
Micro Mouse	Clares	£26
Monitor Stand for A3000	ICS	£21
Podule Case for A3000		£16
RISC OS 3 Upgrade	Acorn	£41
– Bulk package	Acorn	£335
– A5000	Acorn	£17
Seal 'n Type spill-proof Keyboard Covers		
– Archimedes / A5000	Kador	£14
– A3000	Kador	£14
TouchWindow	Lindis	£234
Whisper Fan Quietener (for A300/A400 series only)	ICS	£15

I^2C PRODUCTS . . .

AnDi Oddule	Baildon	£39
I^2C Adaptor (needed unless you already have an I^2C socket)	Baildon	£10
I^2C SWI (enhanced IIC_Control)	Baildon	£15
– bought with Oddule		£5

For ordering details please turn to page 3



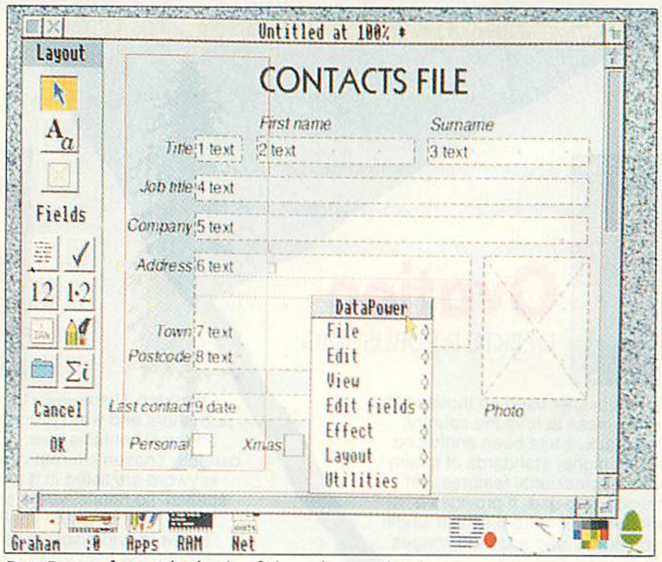
ACORN IS BACK TO THE SOFTWARE

AT one time Acorn had a booming sideline in software under the Acornsoft brand name, which has since been licensed, seemingly indefinitely, to games software house Superior Software.

However, Acorn seems to be marking its return to commercial software with the launch at the Bett show this year of Acorn *Advance*, an integrated suite of productivity software including a word processor, spreadsheet, database and graphing package.

Acorn developed the suite of programs in collaboration with Computer Concepts, Iota, Clares and CRM. The word processor is a revised version of *Impression Junior*, the spreadsheet is a cut-down version of *Schema 2* from Clares and CRM, while Iota provided the database, which is related to *DataPower*.

Aimed primarily at the education market, the package offers a consistent user interface across the different applications. All four *Advance* applications are launched from a single icon, and with a minimum of 1Mb Ram you can run one of the four. Two or four *Advance* applications fit into 2Mb Ram. Risc OS 3.10 or later is needed.



DataPower forms the basis of the Advance database

Acorn has not yet decided on a price, though it is generally expected that *Advance* will retail in the region of £99.

● At Bett, Acorn launched a series of four *World of Number* CD-Roms designed to aid the teaching of mathematics.

Who Stole the Decimal Point is an adventure game in which a series of mathematical problems is must be solved. *Number Games* is a collection of seven puzzles. *Picture Gallery* is a library of photos combined with a simple set of drawing tools. Finally, *Perspectives* uses four on-screen windows to let students view information from different perspectives.

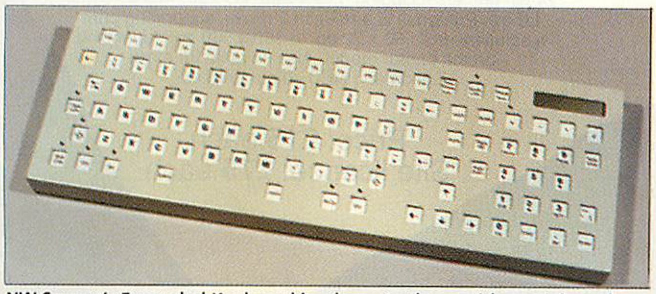
● With the launch of Acorn's Multimedia Expansion Unit, practically any Acorn Risc system can now be upgraded to include a high-speed CD-Rom system. The package includes a latest generation high-speed SCSI Sony CD Rom drive capable of transferring at 300Kbps compared to the more usual 150Kbps; ideal for full motion video like Acorn's Replay system.

KEYS TO SPECIAL NEEDS

THE LATEST hardware development from NW Semerc is the Expanded Keyboard from Special Access Systems. This enhanced version of the Qwerty keyboard is designed for users with poor motor control or learning difficulties.

Users can rest their hands on the keyboard's steel case without accidentally pressing keys and the key press delay can be programmed. CTRL, ALT, SHIFT and DEL key combinations can be used even when the user is only able to press one of the keys at a time.

The Expanded Keyboard is compatible with most Risc OS computers. The price is £475+VAT. Contact NW Semerc on 061–627 4469.


NW Semerc's Expanded Keyboard is a boon to those with special needs

RISC FREE

MORLEY Electronics has announced that certain Risc OS 3 problems can be cured by modifications to its SCSI controller cards.

The problem is caused by excessive demand on processor interrupts. One symptom is that the serial port can lose characters when there is a high interrupt demand. Release 1.1 of the Morley SCSI card firmware has been revised accordingly.

Morley adds that Acorn Replay is now problem-free, using its revised card, something which even Acorn's own SCSI card can't guarantee. Existing Morley SCSI owners can apply for a free Rom upgrade. Morley Electronics is on 091–257 6355.

IN BRIEF

● Those who want to purchase The Keyboard Glove featured in last month's news, will no doubt have noticed the missing telephone number for Naltex. The company can be contacted on (0993) 706303.

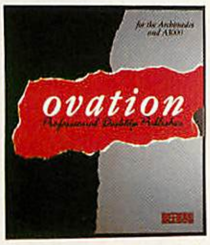
● NW Semerc, the special needs company, has set up a national network of dealers with special Acorn-specific training as a prerequisite. Appointments include Newton Brewer Technical Services, Technology Supplies Ltd, CJ Computing, Honormead, Data Exchange Limited, Le Computer, Kettering Computer Centre, Resource Facilities 92, HCCS, Dabhand Computing and Brilliant Computing.

● Skyfall's latest Budgetware disc contains six fonts which will be of interest to Trekkies; they are all derived from various aspects of *Star Trek*, including the original TV series, *The Next Generation* and the various movies. The fonts are contained on *Budgetware Disc 4*, available for £3.95 inclusive. For further details contact Skyfall on 021-358 7078.

● The Bible Society has released its first BBC Master-compatible software for disabled people. The program, *Luke's Story*, contains Luke's Gospel and the Acts of the Apostles. Luke's story is a user-friendly program which can be connected to a variety of input devices like joysticks and switches according to the user's level of disability. The software is compatible with a speech synthesiser and a Brailler device. *Luke's Story* is £30. For more information contact the Bible Society on (0793) 513713.

● *PowerROUTER* has been released by Silicon Vision to enhance its Arc-PCB circuit board design system. 100 percent Rip-up Retry autorouting is featured. Silicon Vision demonstrates an original rats-nest circuit design re-routed for a double sided board implementation in four minutes. The rats-nest is canned for network connections and results in better routing than individual rat-line routing. *PowerRouter* is £195 including VAT. Silicon Vision is on 081-861 2173.

RISC Developments' Software



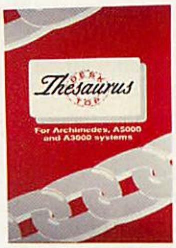
Ovation
DESKTOP PUBLISHING

Ovation is the easy-to-use desktop publisher used on thousands of sites in education, home and business across the country. Now, in response to customer feedback, it has been enhanced with many new features, setting even higher standards of quality and value. Ovation is packed with professional features, yet remains easy-to-learn and instinctive to use. It provides a complete solution for all document generation; from simple single page letters to entire books with diagrams and scanned images.

Try before you buy!

A working demo is available for only £5 (inclusive), which is refundable against a future purchase of Ovation. This version has no Save or Spellcheck facilities. Please write or phone for our detailed Ovation brochure.

Price: **£99**
Site licence: **£475**



Desktop Thesaurus
SYNONYM FINDER

Desktop Thesaurus is a superb companion for all desktop publishers and word processors. It has been recently expanded, and now contains over 17,250 keywords and nearly 182,000 carefully chosen alternative words. The synonyms for the required keyword are listed in a scrolling window according to parts of speech, so nouns, verbs etc. are grouped together. Clicking on any synonym itself then selects that word as a keyword and displays its synonyms allowing you to browse through the data looking for the ideal alternative word. When you have located an alternative word, it may be transferred instantly into almost any application for you.
A special hotlink is provided with Ovation, but it is ideal for use with other packages such as Edit, Impression, Pipedream, 1st Word Plus etc.

Price: **£19**
Site licence: **£95**



TypeStudio
FONT MANIPULATION

TypeStudio is a complete text manipulation package ideal for producing professional quality adverts, posters, banners, logos, letterheads etc. Drawing tools allow lines and curves to be drawn to create almost any shape, along which text can be flowed. Pairs of lines may be linked to create shapes into which text and Draw files may be moulded. A range of special effects are available, including: shadow, slant, 3D and mirror.

Features include:

- Flow text along straight and curved paths
- Mould text and Draw files to shapes
- Wall, floor and graduated shadows
- 3-D, mirror, slant and plinth effects
- Save in internal and Draw file format
- Print using RISC OS printer drivers
- Import Draw files as moulds
- Copy, rotate and magnify
- Grid and zoom facilities

The package includes 7 fonts and a 64-page user guide containing worked examples.

Price: **£45**
Site licence: **£75**



HP500/550 & Star Drivers
PRINTER DRIVERS

The Printer DJ printer driver produces near laser quality output from the highly acclaimed Hewlett Packard DeskJet 500C and 550C colour printers. Both release 2 and release 3 drivers are supplied for each printer, each supporting 75 x 75, 150 x 150 and 300 x 300 print resolutions in monochrome, grey scale and full colour modes. PrinterLC is the approved printer driver for Star colour dot-matrix printers. It is suitable for both 9 and 24-pin printers including: LC24-200, LC-200, XB24-10 and LC-10. PrinterLC is a release 2 driver, supporting print resolutions from 60 x 72 dpi to 360 x 360 dpi depending on the printer model. Also suitable for many Epson and NEC colour printers.

Price: **£15** each
Site licence: **£75** each

RISC developments

RISC Developments Ltd.

117 Hatfield Road, St. Albans, Herts. AL1 4JS Tel. (0727) 40303 Fax. (0727) 860263

All software is available from good dealers or direct from RISC Developments. Please add VAT to all prices and carriage of £3.00 for Ovation and £2 for other software. Please write or phone for details of educational prices and site licences.

CLARES PLANS NEW SOFTWARE

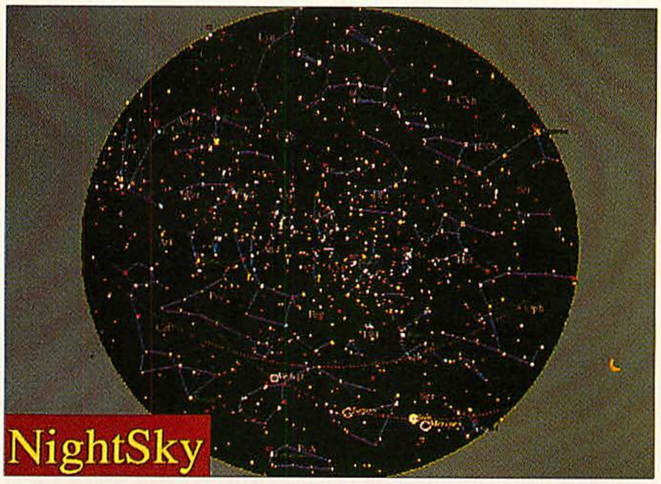
Clares is currently working on three new applications to release over the next six months. *NightSky* (shown opposite) is an astronomy package due for release in spring. It can create starmaps from any place on earth and will cost £79.95.

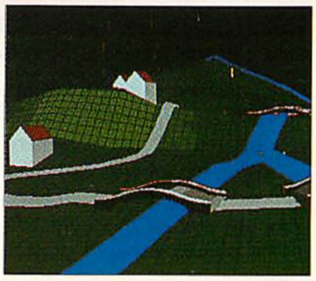
Topographer, shown below, is a geography package that allows you to convert a 2D map into a 3D model on screen. It is due for release in April and will cost £79.95.

Finally, *Plot,* a data presentation package and graph plotter, is due for release in May and will cost £79.95.

Meamwhile the company is also planning to upgrade three of its existing applications. The long-awaited *Schema 2* will offer upward compatibilty with Acorn's *Advance.* Clares hope to release it in mid-year, and it will probably cost about £135. *Rhapsody 3* is the planned addition to the existing *Rhapsody 2* application. It will offer guitar chords, improved layouts and other facilties. *ProArtisan 2* is also underway, and we will look at a preview copy in next month's *BAU.*

Knowledge Organiser 2 is still under development. For more details, contact Clares on (0606) 48511.





IN BRIEF

● Radio station Pirate FM has resorted to computerisation by Archimedes in a bid to replace human DJs.

The station has developed an artificial DJ that involves an Archimedes deciding when to play jingles and music tracks as well as deciding which tracks to play in specially defined sequence. The computer follows a set of rules that govern whether or not a fast or slow song should be played next. The system was recently shown on BBC TV's *Tomorrow's World.*

● A group of 45 schools in and around Hampshire are being sponsored by Acorn to develop a target of 30 integrated multimedia applications.

The year-long Horizon project is being sponsored by Acorn to the tune of £50,000 and will be based around the multimedia authoring packages *Genesis* and *Magpie.* Topics address a wide section of the National Curriculum.

● Superchoice, a subsidiary of the Pontins's Leisure Group, has chosen Acorn equipment for its new residential Active-IT training courses.

Active IT combines high-tech classroom activities with outdoor pursuits, and courses are aimed at students from schools and colleges. For more details, contact Superchoice on (0273) 676467.

● In a direct response to the removal of restrictions on rentals by the Chancellor in his autumn statement, Acorn has announced Options, an equipment and software rental service for schools.

Rental terms will be charged at a fixed rate over three years and it will be possible for customers to upgrade or add new equipment as new technology becomes available. Upgrading as new models emerge has always been a problem for schools.

'Acorn Options eliminates this problem by allowing a school to use its revenue, rather than capital, budget and improves cashflow by spreading the acquisition cost of the equipment over a three-year replacement period,' said Acorn's education marketing manager, Frank Burdett.

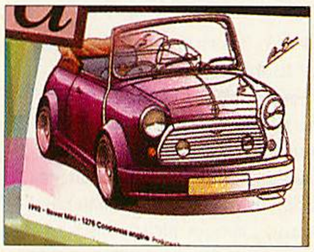
For more details contact Acorn on (0223) 254254.

ART WORKS

THE LATEST version of *Impression 2* (2.18) from Computer Concepts allows *ArtWorks* pictures to be directly rendered within an *Impression* document.

ArtWorks allows anti-aliasing, memory savings with blends or graduated fills, superior PostScript printing, faster rendering and improved colour dithering.

Computer Concepts also intend to make *ArtWorks* rendering technology available to software houses to use in their own applications.


ArtWorks: Impression-compatible

The upgrade costs £10 + VAT but *ArtWorks* owners who already have *Impression* can obtain the upgrade free of charge. For more details, contact Computer Concepts on (0442) 63933.

ACORN SHARES SOAR

ACORN'S share price practically doubled overnight to a peak of 74p early in January, as a US company confirmed that Arm Risc technology was to be used in a revolutionary new games console.

We first brought news of the deal in the January issue of *BAU.* The company behind the high-tech console is called 3D0 and has backing from industry giants AT&T, Matsushita and Time Warner to produce a next-generation console which will use an Arm60 central processor.

3D0 wants to set up an open world standard for its technology to license to third parties. If successful, unit sales could be in the millions. Most of the major UK games software houses have signed up to produce titles for 3D0, and Arm coders are being actively recruited.

The 3D0 Interactive Multiplayer is a CD-based device with exceptional graphics driven by a special controller that can manipulate 3D images extremely fast. The technology represents a major leap ahead of today's state-of-the-art 16-bit games consoles. 3D0 units will be Kodak Photo CD compatible and will be able to play full motion video CDs. Home computer functionality is promised with add-on keyboards and mice. A built-in digital signal processor (DSP) handles high-quality digital sound.

3D0 units will be available in the US in the Autumn priced at around $700 (£465).

Acorn is not mentioned as one of the partner firms developing the 3D0 platform, but a multitasking operating system running under the Arm processor is under development. Acorn is currently working on the next-generation of Archimedes and, no doubt, Acorn engineers will be keen to know what 3D0 is achieving with the same basic Risc processor.

A second major announcement regarding a deal that involves Arm technology is expected in around a month's time. As we went to press, Acorn's share price had settled back to around 60p, which is exactly ten times its value 12 months ago.

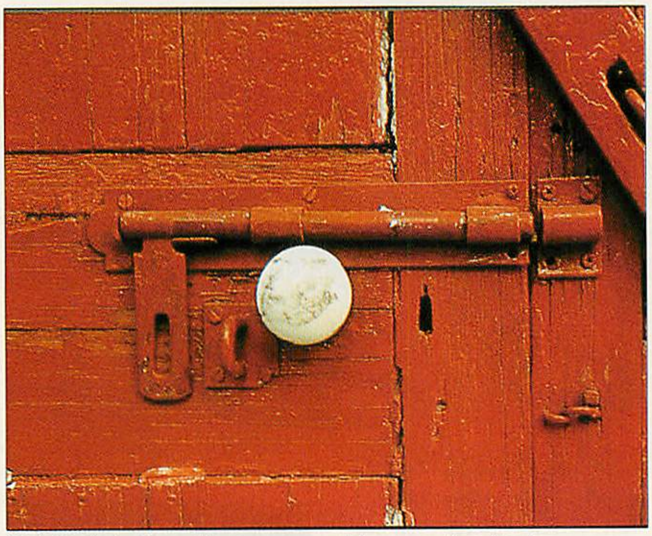
KODAK MAKES DEAL WITH ACORN

AS PREDICTED by *BAU* in January, Acorn has signed up with Kodak to adopt Photo-CD compatibility. As a result, Acorn has agreed to upgrade its CDFS (Compact Disc Filing System) to make it Photo-CD compatible.

Coupled with a suitable multi-session CD-Rom drive, Acorn computers will be able to read Photo-CD and other Mode 2 Form 1 CDs. Existing single-session CD-Rom drives will only be able to read an initial set of images recorded on a Photo CD disc.

The Kodak Photo CD Access Developer's Toolkit will also be ported to the Acorn Risc OS platform. Photo CD will serve as both a source of very high quality off-the-shelf professionally scanned images and as a versatile store of images produced by individuals using their own still cameras.

The Kodak Photo-CD Access Developer's Toolkit will also be ported to the Acorn Risc OS platform.



Kodak's Photo-CD could prove a powerful resource for schools

Malcolm Bird, Acorn's technical director explained: 'Pupils will be able to take a camera out on a school trip and then incorporate images which have been transferred to Photo CD into a computer-based project folder.

Similarly commercial photographic libraries will be able to store their work for distribution to clients in a common computer-readable format.'

Regional business manager for Kodak CD Imaging, Cliff Trott, said: 'Today's announcement by Acorn is a major endorsement of the Photo-CD system and marks the arrival of desktop colour imaging for the UK education market.' Kodak is on (0442) 844255.

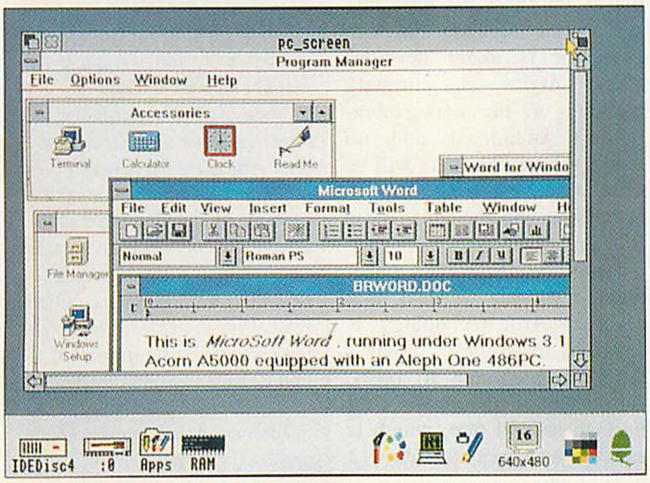
ACORNS AND PCS MEET

ACORN has announced a pair of new PC co-processor cards compatible with the new A3020 and A4000 mini-podule expansion system. The two new cards are a development of Aleph One's successful PC Card.

Acorn provides a keyboard, mouse and display, and the PC card adds MS-Dos and Windows compatibility for those who need to use PC Software.

As with the original Aleph One cards, two models will be offered; a 25MHz 386SX and a 25MHz 486SLC.

Alex Van Someren, Aleph One's technical director, said: 'We are very pleased to be working with Acorn on this exciting venture,' adding that he felt there was great demand for improved integration between the PC and Acorn environments.



Acorn recommends its new 486 card for running Windows

FOSTERING ILLUSIONS

FROM the people behind *Illusions Disk Magazine* comes the first *Illusions* compilations disc containing tutorials on Wimp programming, Arm coding and *Impression* 2 plus a series of articles on supercomputers. There is also a 10,000 word story based on the classic game *Elite*.

The disc is available for £6.95. *Illusions* subscribers can also look forward to a new display program which can handle outline fonts, sprites, tracker tunes and other sound samples as well as other formats and short animations. For more information contact John Reed on 081-997 1037.

● An older disc-based mag, *Absolutely Archimedes*, has changed hands. Now called *Virtuality*, the latest disc has 12 articles written for readers who are interested in learning to program. For further information, contact Toby at 1, The Square, Woolavington, Bridgwater, Somerset, TA7 8DL.

IN BRIEF

● The fourth edition of Acorn's Education Directory is to be made available on CD-Rom. Over 2,000 Acorn-compatible education titles are listed in the new directory. The printed version of the directory has been revised and older eight-bit BBC micro software is now segregated from 32-bit Archimedes titles.

● Five discs of Midi music files are now available for Archimedes users from Words & Music. The selection consists of three discs featuring classical music, one for ragtime fans and lastly one disc of 160 drum patterns.

Each disc is priced at £8.95, including P&P and VAT and if you order all five, one comes free. Words & Music says it is the first company in the business to have converted its titles to the Archimedes format. More titles are expected in the near future. Contact Words & Music on 091-529 4788 or send an SAE to 26 Newark Drive, Whitburn, Sunderland, Tyne & Wear, SR6 7DF.

● Teachers who might need some advice when choosing educational software are being offered a free service by Media Multinational Limited.

The firm has a large cross-referenced database of education software packages that is used by a team of ex-teachers and computer specialists to help potential customers decide.

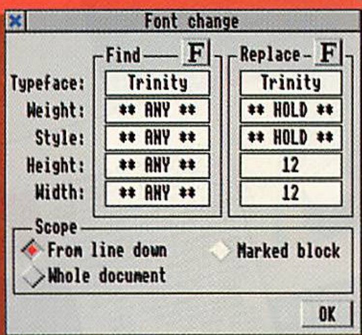
The idea is that, once you've made your choice, Media Multinational will then supply you with that software. For further information, contact Rosemary Demin on 081-540 9100.

● Dec_Data has reduced the price of its multimedia hypertext viewer software from £50+VAT to £25.50. *ClearView* maintains much of its data in memory to avoid lengthy disc drive searches and has the ability to handle and display various picture file formats as well as plain text.

The latest *ClearView* resource software to be released is National Parks. It is aimed at National Curriculum Key Stage 2 and 3 students and costs £8.95. Also from Dec_Data is *Boxi*, a new font which enables boxed text which costs £9.95.This is available for £19.95. Contact Dec_Data on (0392) 221702.

MEET THE NEW ADDITION TO THE PENDOWN FAMILY

Longman Logotron introduces a brand new word processor, with all the ease of use of the famous PenDown and with powerful new features, including:



FONT FIND AND REPLACE for easy changing of any attributes of a font throughout the document.

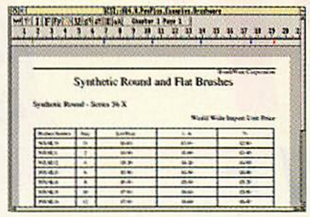
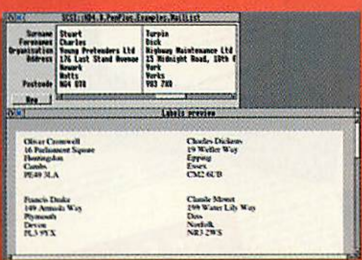
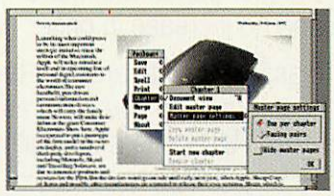


TABLE EDITOR to create, reorganise and perform sum and percentage calculations on tables.



LABEL PRINTING on any kind of RISC OS supported printer.



MASTER PAGES (single or double) and chapters, for creating headers and footers.

ALSO INCLUDES an outstanding new DICTIONARY with over 65,000 words and check-as-you-type facility; MAILMERGE with *!Mail*, a custom name and address database; FLEXIBLE PRINTING CONTROL with automatic booklet printing; CONTINUOUS SCROLLING DOCUMENTS so you don't have to turn pages; VISUAL RULER CONTROL with ruler copy and move; and all the other features which made PenDown easily the top selling word processor for schools.

Archimedes PenDown Plus

RRP £79
Site Licence £400

LONGMAN LOGOTRON

124 Science Park
Milton Road
Cambridge CB4 4ZS
Tel (0223) 425558
Fax (0223) 425349

RECORD YOUR OWN REPLAY CLIPS

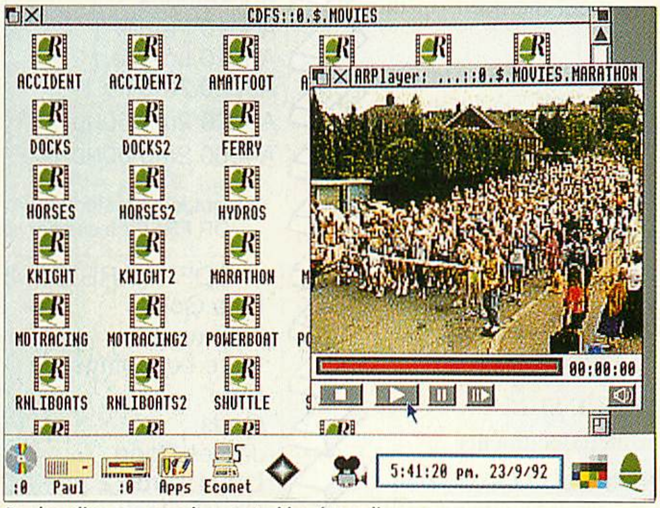
DIY REPLAY recording systems, developed by Irlam Instruments, were on display at the Bett show.

Acorn Replay is used to show moving video clips but until now, there has been no way for users to create their own Replay clips. The transfer had to be achieved by sending a standard video to a bureau, where it could be digitally encoded into Replay format, before being returned on disc.

However, with the new DIY Replay system, Acorn A540- or A5000-compatible Acorn Replay DIY cards can capture video in real time.

A large hard disc is needed to capture the raw data, as this can be 37Mb per minute of video. Compression then reduces this to 5Mb per minute. Prepared sequences can be transferred to CD-Rom or used from hard disc. Acorn's technical director, Malcolm Bird, said: 'The low cost of these devices, coupled with their ease of use, means that this approach is ideally suited to the development of resource materials and for the production of specialised movies for education.'

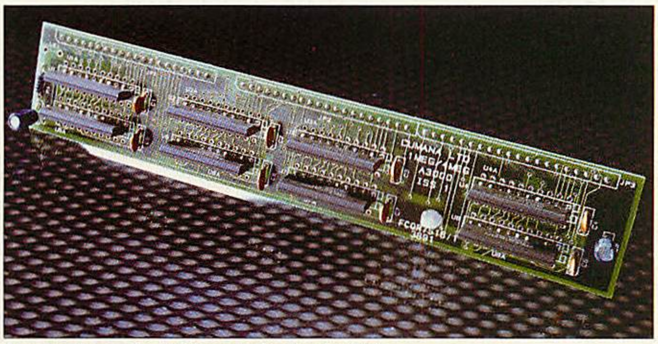
For more details, contact Acorn on (0223) 254254.



Replay clips can now be created by the ordinary user

CUMANA GOES HIGHER

CUMANA has announced a 2Mb Ram upgrade for A5000 users wanting to increase their machine's memory to a total of 4Mb. Education customers can buy the upgrade for £95+VAT, while other customers will be charged £112+VAT. Cumana has also reduced the price of its 4Mb upgrade for the A3000 from £182 to £95.


Cumana's new board boosts the Arc by 2Mb

CHANGING FORTUNES

WHAT has happened to the two founders of Acorn Computers, Chris Curry and Hermann Hauser?

Fortune did not smile on Curry; high-tech projects like Red Boxes and KeylineTeleshopping failed to take off. Croxton Park, Curry's most recent, was advertised for £1.8 million after its repossession

On the other hand, Hauser had mixed fortunes; firstly as a technology guru within Olivetti and later setting up the Active Book Company (ABC) working on a pen-based portable personal computer.

The ABC project was virtually abandoned last year when it was acquired by EO, working on a similar project.

Ironically for Hauser, who transferred to EO, the new machine uses the AT&T Hobbit processor; the only chip comparable to the Arm chip Hauser originally developed.

ACE MERGES WITH OAK

OAK Solutions and Ace Computing are to merge. For Oak Solutions, this is the latest merger deal since Oak merged with Software Solutions two years ago.

Ace Computing is best known for its wide range of Risc OS printer drivers, as well as the *Euclid 3D* drawing and animation package. The Ace name will continue to be used for printer drivers.

Ace Computing's managing director, Tony Cheal, explained that before the merger between the two companies had been settled, he had been increasingly concerned that research and development was being restricted by the need to concentrate on day-to-day commercial necessities.

Cheal said: 'We believe that this merger will allow us to focus attention on software development and support, and the cross fertilisation of ideas and expertise should prove inspiring.'

Oak Solutions' David Tea added; 'By combining our talents we can establish Oak Solutions as one of the most significant forces in education technology.'

IN BRIEF

● Turing Tools has announced a new security application called *IronMask*. This is designed to provide password security to selected files under Risc OS. Not only is unauthorised access prevented by the password system, but protected files can be encrypted and isolated from normal Risc OS operations that might endanger them.

Files are protected by the *IronMask* application so, if such a file is transferred by floppy to another computer without *IronMask*, it may be deleted or inspected but it remains encrypted.

IronMask is priced £59, with subsequent orders discounted to £39. Turing Tools can be contacted on (0865) 775059.

● Acorn continues to be the leading supplier of computers to schools, according to figures released by market researchers RS&M. From April to October last year, 67 percent of schools which bought computers chose Acorn kit. The figure was an even more impressive 77 percent in the Primary sector, up from 74 percent.

Independent schools appeared to be switching across to Acorn with the share in this sector rising from 30 to 41 percent. The BBC A3000 was the best selling schools computer, with twice as many shipped compared with its nearest rival, the RM 386PC.

● A unique foreign language dictionary program called *Linguist* is now available from Mike Smith. The program currently covers 18 languages.

As well as straight translations, *Linguist* also has a 'quiz' mode for brushing up vocabulary. An automatic look-up feature can be used for translating a block of text though each word is translated in isolation and Mike Smith warns that really meaningful results do not tend to come from this type of computer translation. The package is available for £20.

A free stripped-down demo version of *Linguist* has been distributed on BBSs. For further information on the package contact Bits 'n' Bytes, M D Smith, 26 Grenville Road, Saint Judes, Plymouth, Devon PL4 9PY. Tel: (0752) 667 599.

Ian Burley

'MICRO-TRADER' BUSINESS SYSTEM

'Micro-Trader' consists of a powerful range of computer programs to meet the many needs of the small to medium sized business.

'Micro-Trader' provides professional integrated accounts that have been designed by a businessman to meet the needs of the businessman.

'Micro-Trader' has been specially developed for multi-tasking operation under RISC-OS on the A3000, A5000 and Archimedes computers.

'MICRO-TRADER' FEATURES

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COMING SOON ...... PAYROLL MODULE

The system manual is excellent ... it is both comprehensive and easy to follow" - Acorn User June`92

"The forms are masterpieces of good layout and the handbook is comprehensive and well written" - MU May`92

Micro Trader has been examined by a C&E VAT inspector.
He has passed MT as being suitable for VAT accounting requirements.

Micro Trader complies with the new VAT requirements including the new VAT return & EC Sales Listing (ESL)

"The Micro Trader System is so flexible and easy to use ... who says accounts can`t be fun? .. I have really enjoyed using the system on the Archimedes" - a Yorkshire commercial user

"The package was obviously designed by someone with experience at the sharp end of book-keeping and accounts" - Acorn User June`92

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"It is powerful, flexible and certainly a pleasure to use" - Acorn User June`92

"The Micro Trader System is so flexible and easy to use ... who says accounts can`t be fun? .. I have really enjoyed using the system on the Archimedes" - a Yorkshire commercial user

"Micro Trader offered me all the facilities I required with easily understandable commands at a very reasonable price, especially compared with other PC packages ... I am very pleased to say not only is the system excellent but the help and prompt after sales service has been first class" - A Berkshire user

The 'Micro-Trader' Business System is easy to use and offers a complete powerful and flexible business system for only £79.95+VAT per module - System price £279+VAT - *demo disc available.*

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PinPoint Junior	24.95
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Imagery	74.95
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UPGRADES

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RISC OS 3	41.70
" A5000	16.17
" upgrade kit	25.53
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Citizen Swift 240C	247.00
HP 550c	459.00
printers supplied with cable & driver	
CD ROM pckg	649.00
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Monitor Plinth (&3020)	24.95
2mb RAM upgrade	39.00
A300/400	
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A3000 UPGRADES

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IMAGINA IS THE LIMIT

THE IMAGINA Festival is a forum where experts and enthusiasts can meet to show off their work from the past year. The two American companies, LucasArts Entertainment – closely linked with the famous Industrial Light and Magic group – and Walt Disney, often use the event to showcase their most recent work. This year, Disney took the opportunity to preview the soon to be released cartoon, *Aladdin*.

The film features pioneering techniques, with computers being used for full facial animation and automatic lip synchronisation; two areas that are traditionally done by hand.

Although much of the work shown at the festival is related to serious uses such as medicine and engineering, computer games get wide coverage, with conferences covering all the latest techniques such as virtual reality and real-time 'leisure' simulators.

The Commander simulator, from Rediffusion in Sussex, was premiered at Imagina and was no doubt a surprise for the foreign competition. It's a sit-in, one or two person simulator, that uses a hydraulic mechanism to move itself.

Although it uses a 286 PC board at its centre, the more complex parts of the machine are all controlled with Arm3 processors. After the show, it shouldn't be too long before it makes its appearance in games arcades in England.

SECOND GO

PROARTISAN 2 is the latest version of Clares' popular art package. It will have added features such as powerful masking options and new special effects, and will cost £135. The planned release date is early summer, but look out for our preview in next month's *BAU*.



AN ARMFUL OF GAMES

ACORN'S off-shoot company, Arm Ltd, recently announced the selection of its Arm60 processor by The 3D0 Company for its new Interactive Multiplayer. The 3D0 system uses a revolutionary graphics/animation system to achieve processing speeds up to 50 times those of conventional computers and consoles. Because of the huge increase in speed, software running on the machine will give a far greater feeling of personal involvement.

Trip Hawkins, the president of The 3D0 company, said that the only processor that could handle the workload required for such a machine was the Arm60.

The compact disc version of the Interactive Player will be the first version of the machine to be released, and will support most formats of CD including music CDs, Photo-CD and motion-video CDs. Although no price has been fixed, the launch date has been set for the third quarter of 1993.

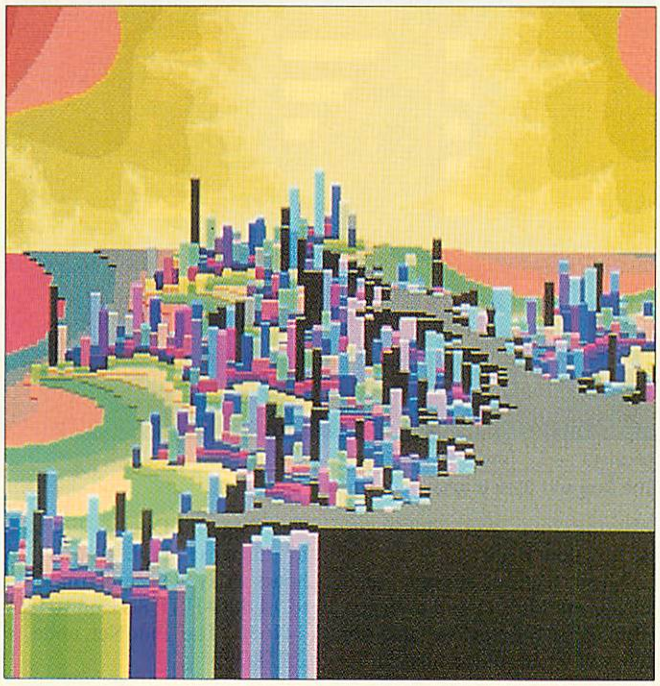
Further details of the new machine should become available towards the launch date, so keep an eye on this column for more news.

PIC OF THE MONTH

AS WELL as having artistic merit, this month's picture was selected for the innovative way in which it was produced. You can probably guess how *MandelCity* from Alistair Brown got it's name, especially looking at the shape of the sun.

Both parts of Alistair's picture – the rising sun and city of tower blocks – were created using his own programs, which use the Mandelbrot set as their basis. The effect is quite amazing, considering the relative simplicity of the idea.

If you want to contribute your own work to the Graphics Page, please send it in, with details on how the picture was designed and preferably on 3.5in disc, to the usual *BBC Acorn User* address, given in full below.



NEWS IN BRIEF

● A new book promising to provide information about all aspects of computer graphics on Acorn 32-bit machines has just been released by publisher Dabs Press. *Graphics On The Arm* has been written to explain the use of graphical software for the Archimedes, as well as providing hints and tips about scanning and picture manipulation. The book costs £14.95, and is available from most larger book shops, or direct from Dabs Press, Freepost PR1327 Leyland, Preston, PR5 3BR. Further details can be obtained from Dabs Press on (0772) 623000.

● A number of readers responded to the recent window icons competition on the Graphics Page, the results of which should appear soon. 3D icons certainly seemed the most popular, although there were one or two, more 'original' entries; in particular, a nice set with 'Smiley' faces.The competition will stay open for a couple more months to allow for a bit more variety to choose from. Entries should be sent to the usual GP address and marked 'Window Icons Competition'.

● Users of State Machine's G8+ Graphic Accelerator will soon be able to upgrade their cards to provide 15-bit colour output, similar to Computer Concepts Colour Card. The upgrade consists of a small hardware modification so cards will have to be returned to State Machine themselves. No price has been fixed yet, although up to date details can be obtained from State Machine at Advanced House, Upper Wellington Street, Luton, LU1 5AA. Tel. (0582) 484266. Meanwhile, the top of the range G8 Professional card is close to being finished, and should be 'ready soon'. The card will support 16-bit colour as standard at resolutions of up to 800x600. The cost will be £410+VAT.

● You can contact the Graphics Page by writing to Rob Miller, The Graphics Page, BBC Acorn User, 101 Bayham Street, London NW1 0AG, or by modem via Arcade BBS user #1144.

SEND OUT AN ALL POINTS BULLETIN

IF you're hooked on the idea of using bulletin boards but want to keep down your call costs, one way is to run a FidoNet Point system off a local FidoNet BBS. Thomas Olsson's PD program *FidoMail* allows you to do just this, and offers most of the facilities you'd get on the main system.

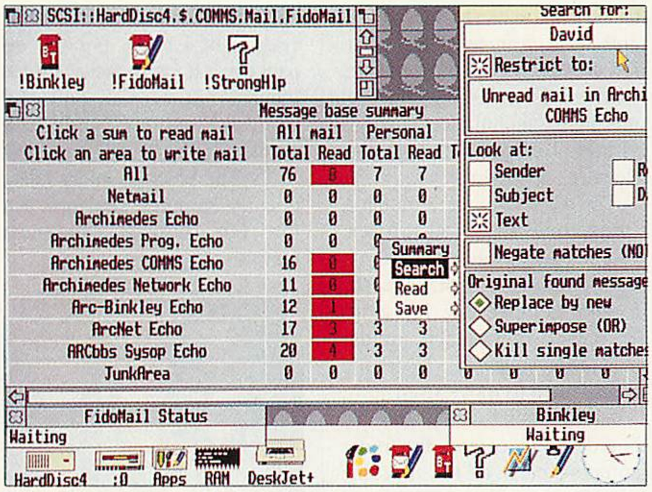
It's rather like running your own personal BBS with only one user; you. By arrangement with the sysop of your local BBS, which must be a full FidoNet node, you run *FidoMail* and a comms utility program called a 'mailer'.

These two programs can be configured to call up your 'Boss' system automatically and exchange any mail messages at the cheapest call rate, say at 7am. Then at your leisure, you can read messages from, and contribute to any of the Echomail subject areas the Boss system carries, and can send and receive private mail worldwide.

Fidomail is a network mail editor that processes incoming mail messages – called packets – and presents them in an easily classified and readable form. It is fully multitasking and window-based.

You can write and edit any messages in a *FidoMail* editor window and the message packets are bundled together to wait in a special directory until the time you have selected for mailout, when the mailer program dials up your Boss; sends off the messages and picks up any new messages. Your message base can build up into a useful reference source, and *Fidomail* offers search facilities on any part of the message base. It also allows you to 'weed' out old messages.

Fidomail is available free from some Archimedes BBSs as a download, although it requires careful configuration and help from the sysop of the Boss system.



Fidomail: your personal bulletin board

DOWN AT THE OLD DOG AND DUCK

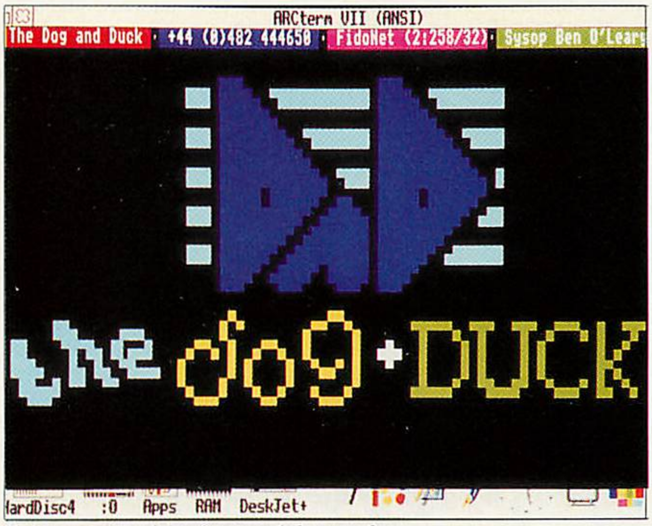
FANCY meeting for a natter down at the Dog and Duck? It thinks it's a pub, but it's really a bulletin board based in Hull and run by Ben O'Leary and Keiran Connell. Ben, as the Landlord, looks after the PC section, which boasts 620Mb of downloads and over 180 FidoNet message echoes.

The Archimedes section is served by Keiran, the Bar Manager, and contains an Acorn Support Area, Archimedes Echomail areas and file downloads that include 115 Archimedes demos and over 1,000 *Soundtracker* modules.

All round the walls in the Dog and Duck are colourful Ansi graphics, and the staff are keen to make you feel welcome with light-hearted banter. An unusual feature is a sysop starter area, offering downloads of PD bulletin board software (for PCs) and offering help and advice on setting up a BBS.

Music features strongly, and if you couldn't attend a recent gig, there's a review area to tell you what you've missed.

The Dog and Duck is licensed to dispense high spirits 24 hours a day at speeds from 300 to 14,400+HST 8N1 on (0482) 444650. The FidoNet node is 2:258/32.



The Dog and Duck is what your left Arm's for

NEWS IN BRIEF

● THE Digital Databank is a new ArcBBS system run by John Stonier in Welwyn Garden City, Herts. John aims to provide a central database of Acorn information, with sections for third-party product news and demos, a clip-art collection, Acorn user-group discussion and newsletters, PD downloads, shopping service and even a Job Centre. The Digital Databank is also part of the FidoNet system. You can access the Digital Databank on (0707) 329306 (300-14k4Bd 24hrs) or (0707) 323531 (300-2400Bd 18-06hrs) 8N1 scrolling, FidoNet Node 2:254/25.0.

● USERS of Prestel in the UK can now access the French Teletel system through the new Minitel Link, and obtain Paris stock market prices, travel and tourist information, food and wine guides, entertainment and other information. There is no extra registration or fee for a Minitel Link, but there are premium charges of 15p/minute for Télétel directory enquiries and 35p/minute for main database services. French videotex users – there are over 6 million of them – are now able to access a range of Prestel services by dialling a number in France (3619) and keying the code GB1. For more information call free on (0800) 200700.

● OUT of the ashes of Connections BBS comes Arctic, the new Archimedes system run by Steve Pursey and Ian Scott in West London. Steve and Ian have grasped the nettle and gone for a full FidoNet system running ArcBBS. Areas of interest will include BBC machines previously supported and expand to cover Acorn Risc machines and the FidoNet Archimedes echoes. Arctic is provisionally connected as a FidoNet Point off Arcade BBS as 2:254/27.2, and provides another point of contact for Acorn comms enthusiasts in the London area. Call 24hrs on 081-903 1309 8N1 300-2400Bd (shortly to be upgraded to V32bis)

● YOU can contact me with any news or information you'd like to be included by writing to: David Dade, BBC Acorn User, 101 Bayham Street, London NW1 0AG or by modem on Arcade BBS, User #2 - 081-654 2212 or 081-655 4412

ACORN DOESN'T MISS A BETT

ACORN at Bett was showing off two new products for the first time, both of which are of importance to schools.

The first, the multimedia expansion box, is a piece of equipment looking like an A4000 box, but containing a new Sony CD-Rom drive, which is fast and multi-sessioning and fast. The multimedia box allows the possible addition of two other devices, such as a second drive, a hard disc or power amplification. SCSI interfaces are included and the audio mixing looked and sounded impressive.

Along with the deal signed with Kodak recently and the rumoured price of around £500, this piece of equipment is going to make Photo-CD a affordable possibility in schools very soon. Photos taken on field trips will be transferred to DTP documents with the minimum of fuss and expense: a very attractive proposition; and the unit works on all machine bases.

The second offering from Acorn was *Advance*, a new piece of fully integrated software with wordprocessing, spreadsheet, database and graph facilities held under one icon and movement between the two a fairly simple process.

As an AEC leader, I remember asking for this piece of software in 1989 and it is nice to see it now; especially as it is priced at well under £100 and makes good use of software features already available on other third party products. Secondary IT co-ordinators should take a closer look at the final release.



Pocket Book: a guide to the show

Acorn's Bett stand was awash with Pocket Books, used by all staff and the information students to guide people round the show.

The main database was prepared by Acorn and loaded on to each machines and demonstrations of the long awaited A-link were available on the stand. The linking software is now being shipped to dealers and should be available to all Pocket Book owners.

MANAGING YOUR NET

IF YOU are running a level 4 network, or are planning to, you will pleased to hear of a new software application called *NetManage,* available at the end of February. Those who have attended networking sessions with Acorn, myself included, will recognise the need for management software that matches what we have to do in school.

The *NetManage* software, developed in Australia, goes a long way in the right direction. It works with all Level 4 fileservers, Level 3 and Filestore, Econet and Ethernet and makes *Manager* a thing of the past. Users can be displayed in groups and set up from a database as a CSV file.

Groups of users can have items sent to their directories or collected from them for assessment and teaching purposes. They can also be set up with an alterable set of default characteristics and a default directory structure. If priced at around £50, as seems likely, it is sure to be popular item for school managers.

BOOKS THAT TELL TALES



THERE was, as always, plenty of Acorn software at the Bett show. One of my favourites was the new range of talking books by Sherston. They really do talk and in real human voices. A must for early year classrooms and slow readers. The written book comes with each story as well. Words are highlighted as they are spoken. Contact Sherston on (0666) 840433.

SJ GETS ON THE BUS

THE SJ Research stand at Bett was dominated by its new double decker training bus. Painted in blue and white and equipped with A3020 machines connected via Nexus and Ethernet, the bus will be available round the country for teachers to use for training purposes. During the show, the top deck of the bus was used to demonstrate a PC, an Apple Macintosh, a variety of Risc OS machines, a Master128, a Unix fileserver, Ethernet and Nexus connections and an MDFS server, all able to access fully formatted data.

IN BRIEF

● This year's Educational Technology Awards were announced at the Bett Show. The primary gold went to *Crystal Rainforest* by Sherston Software: Tel (0666) 840433. The Primary Bronze was awarded to NW Semerc: Tel 061-627 4469, for its Oldham Overlay Keyboard.

Eureka by Longman Logotron picked up the Secondary Bronze whereas the Secondary Gold was given to Chadwick Healey, for its collection of CD-Roms. Contact Chadwick Healey on (0223) 311479.

● Icon Technology was demonstrating their latest wordprocessor offering, *StartWrite*. It is a cut-down version of *Easiwriter*, and I suspect that many primary teachers will be interested in the simplicity of its approach.

Some minor drawbacks are the amount of memory it requires, no less than a 2Mb machine. Also it would be more useful for children with specific learning difficulties if it could speak to us as well. Priced at £60, we will take a look at Icon's *StartWrite* in next month's issue.

● Space is this month's *BAU* theme, and there are plenty of special packages that teachers should not miss out on. For instance, check out the addition of a pack of space clip art and stationary to go with ESM's successful *Desktop Folio* publishing software.

Pictures of galaxies known and unknown, logs and diagrams for watching the moon in its various phases, pictures of travellers of the universe coming from someone's vivid imagination and starship logs for intrepid travellers are all features sure to appeal to young space fans.

Add to this satellite pictures of the daily weather around the world downloaded from the Hampshire database on Campus 2000 and to Nasa space photos from a CD-Rom and the sky is no longer the limit.

● NEXT MONTH I will be looking at some hardware add-ons from HCCS and the latest software from ESM and NW Semerc.

Clare Johnson

Harrogate in Spring !

BBC ACORN USER SHOW GOES NORTH



Harrogate International Centre - 15th, 16th & 17th April 1993

With over 40 stands to visit, the Spring Show is your chance to see all the latest products and services in the ACORN WORLD. There will be plenty of bargains and new releases, suitable for all types of users. Set in Harrogate, the Spring Show is convenient for Leeds, Manchester and other major northern cities. To be sure of entry send off for your advance tickets using the form below.

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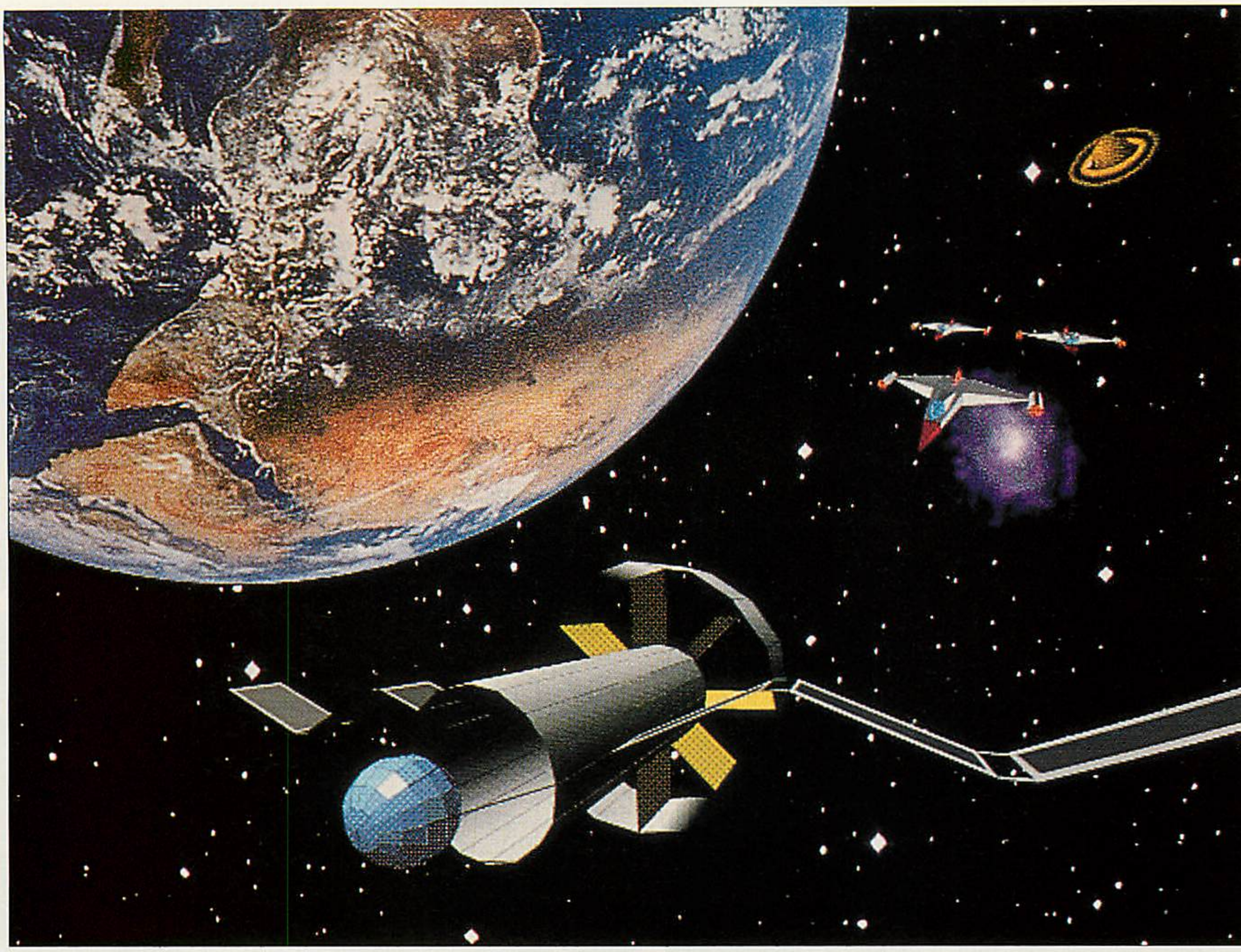
[ ] Expiry Date [ ]

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CREATING SPACE

Rob Miller boldly goes where no art package has been before

Space is a realm where the artist's imagination can really roam; just look at some of the excellent science fiction art that has been produced over the years. Here, I will show how to combine a number of art packages – with spectacular effect – to give the illustration above.

A useful reference at this point was a book of pictures by the SF illustrator Chris Foss. If you're ever short of ideas, or want to see how someone else has achieved a particular effect, a flick through a book, or even a trip down to your local art gallery is well worth the effort. In much the same way as reading a lot should improve your vocabulary, studying as many pictures as possible should make it easier to visualise possible work of your own.

Although the picture was to be basically a work of 'fantasy', it still needed to look realistic and believable. There are a number of techniques you can use that work particularly well in this situation: real images – The picture of Earth; long perspective – the spaceship; and recognisable images as reference points in the picture – Saturn in the distance. The combined effect of all three help to give a sense of scale and depth to the picture.

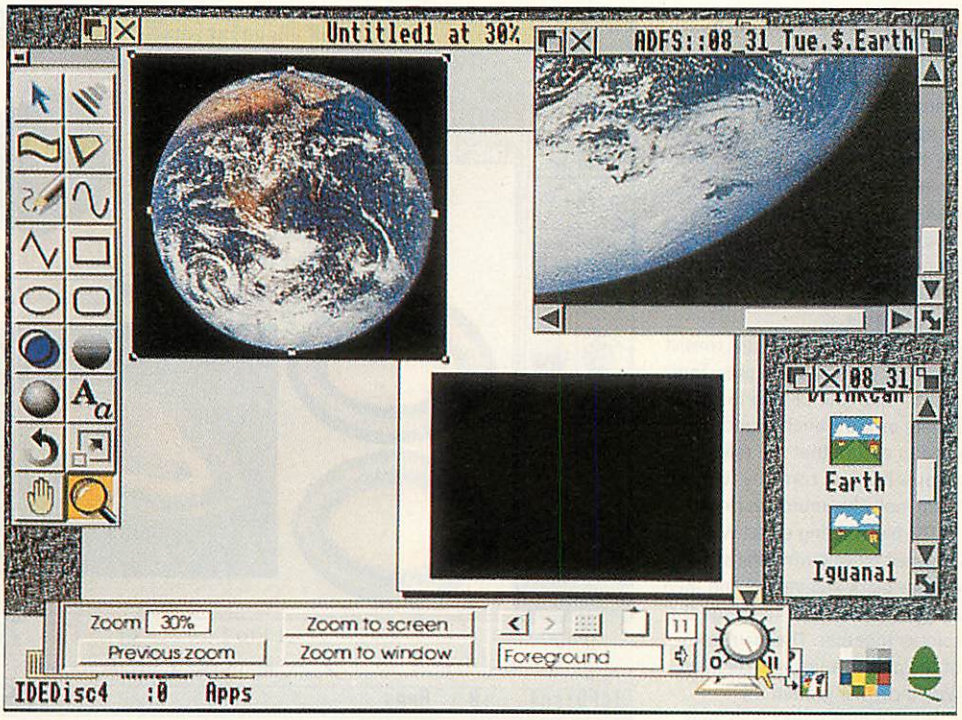
It's no good starting anything unless you have the right tools for the task. The multi-tasking way that the Risc OS works means that it's easy to produce drawings and pictures in one application and then transfer them to another package for further processing.

The common file formats used by various applications (Draw files, sprites and so on) makes it easy to, for example, generate a perspective view of an object in *Euclid*, and then transfer it to *ArtWorks* to shade it in.

After some thought, I decided to use a combination of *Euclid, Artworks and Revelation ImagePro* as the main programs. *Draw* and *Paint* were also used to some extent, plus *ChangeFSI* for some conversion and scaling of sprites. I did think about using a raytracer such as *Render Bender 2*, but I found I could achieve the same, or better, effect with *ArtWorks*.

Euclid is supplied by Ace Computing, (0223) 322559, *ArtWorks* by Computer Concepts, (0442) 63933 and *ImagePro* by Longman Logotron, (0223) 42558.

EARTH WORK



Setting the picture in space obviously called for a backdrop of stars and perhaps planets. Mode 28 was chosen for a number of reasons; high resolution to make dithering more effective and a maximum number of colours and square pixels so that diagonal lines and curves do not appear 'stepped'.

To start off, I created a single black sprite in *Paint*, 640 pixels wide and 480 pixels high (meaning the size of a Mode 28 screen). This was then loaded into *ArtWorks* and used as a guide to the area I had to work on. Anything that lay outside the black background would effectively be 'cropped' out of the finished picture.

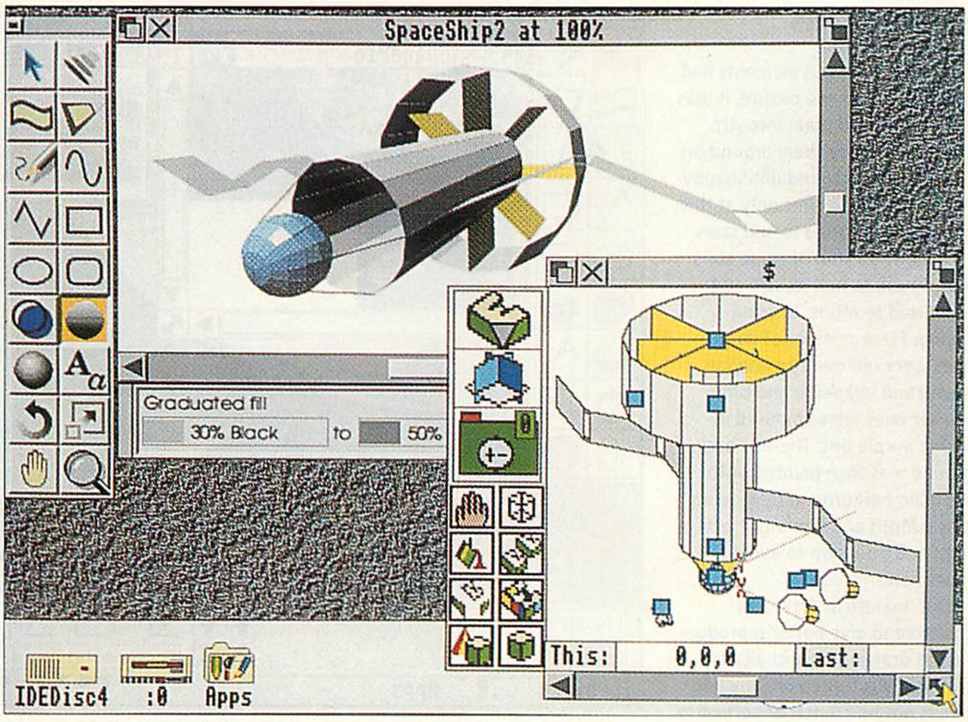
The Earth cut-out was added next. The original version of the Earth picture was too large, so was scaled down using *ChangeFSI* and converted to Mode 28 to make sure it appeared correctly proportioned in the final picture.

Being a scanned picture, the Earth cut-out contained a certain number of spurious pixels in the background. At first, I thought it would be easy to remove these by hand, but found it difficult to keep the circular shape of planet.

The solution was to create a black mask with a circular hole in, so that the Earth showed through. This was achieved in *ArtWorks* by drawing a black-filled rectangle, plus a circle slightly smaller than the size of the Earth, and merging the two to create the mask.

It was easy to move the Earth cut-out around until I was happy with how it looked, and then to cut it out from the screen using the Snapshot facility in *Paint*. Only half the Earth cut-out could be viewed on screen at 100% magnification, so it was fortunate only the bottom half was needed.

SPACE CRUISER



The main feature of the picture was to be a large 'space cruiser' type spaceship. I'd already played around with a few spaceships using the 3D modelling package, *Euclid*, so it was easy to amalgamate a few ideas.

Although the majority of comic book art is hand-drawn, it's not uncommon for the artist to use a computer to generate simple drafts to act literally as guidelines for the drawing.

In a typical 3D design program (such as *Euclid*), once an object has been entered, any view can be generated by the computer. True perspective can be applied to objects to make them look very close, far away, big or small.

The space cruiser was designed from a number of solid shapes and the finished view created using the camera tool to create the perspective. This was then exported from *Euclid* to *ArtWorks* as a *Draw* file.

Shading was primarily done using the lighting tools in *Euclid*, although parts such as the main body cylinder were further rendered with the graded-fill tool in *ArtWorks* to give a more smooth appearance. The solar panels and the black tow lines were added by hand in *ArtWorks*.

Groups of similar objects can be created easily by duplicating one shape a number of times.

The three fighter craft in the picture were copied from the ship used in last January's *Imagery* review and arranged so that they were flying in formation.

The three fighters were then transferred to *ArtWorks*, grouped together and then scaled down to make them appear far behind the space cruiser.

RINGS AND THINGS

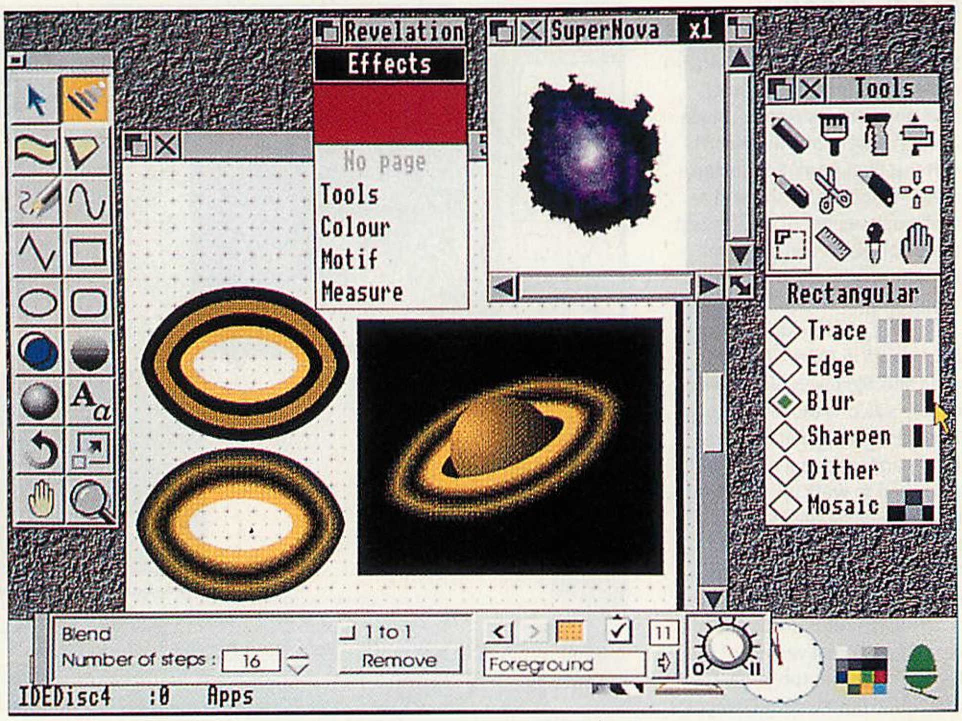
At first, the image of Saturn was going to be larger in the finished picture, and I thought of using a ray-tracing program (such as *Ray Shade*) to produce a realistic planet 'texture'. After doodling around in *ArtWorks* though, I found it was easy to produce a very lifelike representation of the ringed planet.

The rings around Saturn consist purely of eight semi-ellipses, four in front and four behind the main sphere of the planet. A grid was used to ensure that the semi-ellipses lined up correctly to make them look like unbroken rings.

The blurred ring effect was achieved by colouring the semi-ellipses black and yellow and then using the blend tool to merge the colours together. The main body of the planet is just a circle filled with a circular graded fill.

What would have taken ages to draw accurately by hand (and even longer to design and render in *Ray Shade*, took just a few minutes using *ArtWorks*.

The other deep space feature, the supernova, was to be created in *ArtWorks*, using the blend tool



to get the range of colours from white, through purple, to black. The misty effect was rather difficult to get with *ArtWorks* 'exact' tools, so it was back to traditional sprite manipulation in *Revelation ImagePro*.

A rough splodge of purple was drawn on a black background and a combination of the spraygun tool with a black tint was used to fade the purple to black on the edge of the supernova. A similar set-up with a white tint was used for the centre. The blur tool was then used a number of times to give it a misty look.

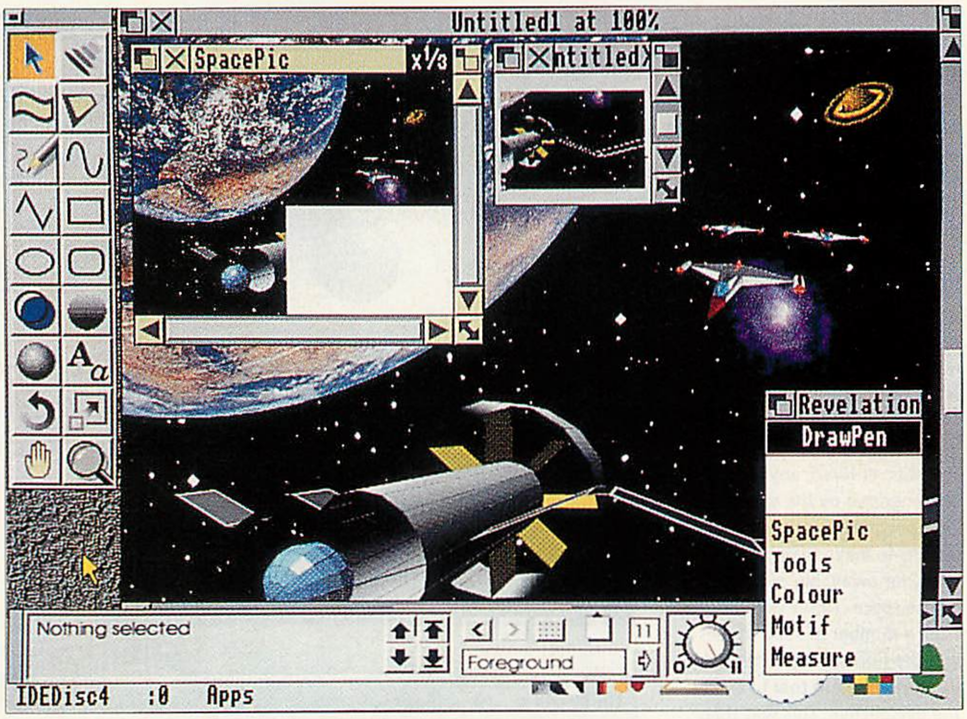
The finished supernova was cut out and transferred to *Paint* where the black background was replaced with a transparent mask.

SEEING STARS

Once all the various elements had been drawn for the picture, it was possible to load them into *ArtWorks* and move them around on the black background until happy with the result. It was only at this point that I decided to add stars.

A Mode 13 scan of some stars was shrunk to half its size and converted to Mode 28 using *ChangeFSI*. A number of large stars were removed by hand in *Revelation ImagePro* and other smaller ones were coloured in with a purple tint. The star background was then painted onto the main background by loading it as a Motif and flipping it left/right and up/down to avoid repetition.

One feature in *ArtWorks* designed to give better reproduction of drawings is anti-aliasing. If the facility is turned on, any line that is not horizontal or vertical is automatically anti-aliased so that it appears smooth. Most of the elements in the foreground of the picture were line drawings (as opposed to bitmaps) so the anti-aliasing worked particularly well.



When the whole picture was arranged 'correctly', it was grabbed as a bit-map image, directly from the *ArtWorks* window. Unfortunately, I forgot that when scaled to 100 percent in Mode 28, the picture would have a window border around it. It therefore had to be cut up into four sections.

Each piece was loaded into *Paint* and trimmed down, using the black background as a guide to deleting rows and columns. The four pieces were then stuck together in *Revelation ImagePro* by loading each one as a Motif, and painting them onto a Mode 28-sized, white background.

JOURNEY INTO S-BASE

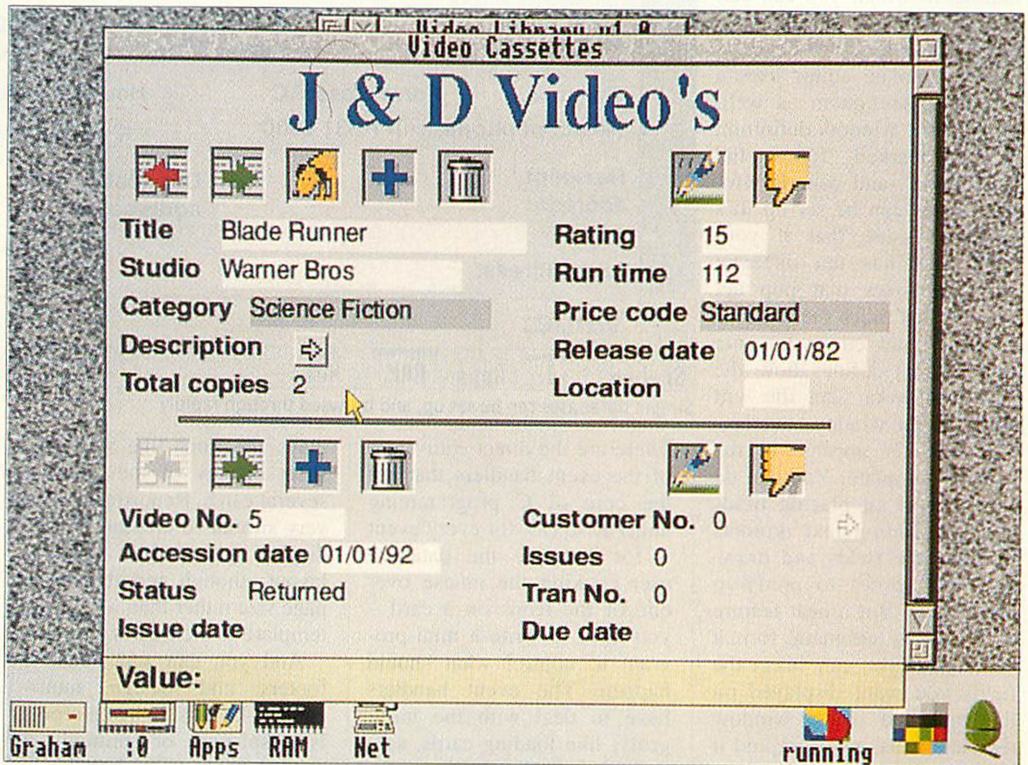
Graham Bell investigates the latest thing in programmable databases

Hitherto, Risc OS databases have come in but one flavour, flat-file and unprogrammable, each distinguished by its degree of graphical sophistication and ease of use.

The primary database managers on the market now are probably Digital Services' *Squirrel* and Minerva's various offerings, along with the new *Datapower* from Iota: Beebug's well-known *Masterfile* is due any day soon in a Risc OS version. But there are probably just as many collections of data held on Archimedes machines using Colton's *Pipedream*.

S-Base fills a clear gap in this applications base – a database manager for developing both commercial and personal database applications – because it is programmable.

With all the Arc database managers, you can define and manipulate complex database structures. But *S-Base* takes a much more disciplined, less graphical approach to database design that's more suited to large, carefully-planned projects. You can go further, writing your own procedures and mini-programs to manipulate the data in your database in any way you want.



S-Base may not be for the database novice, but it does offer unrivalled flexibility, mixing text and icons

WRITING IT

In fact, writing programs in *S-Base* is an essential step. There is no 'easy setup' as simple as with *Squirrel* or *Datapower*, no 'draw your database'. It's not for the fainthearted, as a glance at the manual confirms; 225 pages of in-depth tutorial supplemented by an equally weighty reference. The lot will install on any 2Mb Arc, but for any serious work, a hard disc and Risc OS 3 are desirable.

An *S-Base* application, a database, begins life as an empty set of 'resources', which depend on one another in a hierarchical manner. At the bottom level are the data types; things like integers, dates or strings. The data types you define have names that can be used throughout the application, so you can define a seven character string as a 'car registration' or a ten figure number as an 'ISBN'.

All the data types your application needs have to be assembled from one- to four-byte integers, single or double-precision real numbers, fixed-length text strings, times and dates. You can define structures, combinations of basic data types, so a data type called an 'appointment' could be a combination of a time, a date, and a place name string.

There's also support for 'blobs', binary large objects like sprites or Replay files, which cannot be stored directly, and for other variable-length elements.

Once you've defined your data types, they can be used to define the structure of your application's main data file on disc. A datafile of business customers could include fields called 'title', 'initials', 'surname', 'address', 'phone', 'fax' and so on, each making use of one of the previously-defined data types. Obviously, the phone and fax fields would share the same type.

Next, you can define a series of font styles. These are just like styles in a DTP application, and they control how text will appear on screen or in any printed reports. Indeed, they are set up in the same way, with a dialogue almost identical to that in *Eureka*.

The font styles are used to display any text in templates and formats. A template is like a standard Risc OS template file, which will be familiar to most programmers. It defines the style and size of a window on screen – whether it has all the relevant window gadgets around the outside – and also the placement of icons within the window.

The icons are important, as they form the 'command buttons' of your application. The format builds upon the template, and overlays data fields drawn from your file definition. Between the two, they define how your database will look on screen.

S-Base's template editor is quite different in style from Acorn's own. Using it, you edit a single window at a time, setting up the gadgets, the window colours and so on from a long dialogue box, and there are *Draw*-type tools for placing and editing the style of

icons, renumbering them, even grabbing icons from other applications. A grid helps immensely with accurate placement, and best of all, there is a 'try out' button that shows you exactly what the final window will look like.

Adding icons is simple, and there is a selection already set up that includes almost everything you're likely to need; OK, Cancel buttons, blank buttons to which you can add your own text, even those fancy 3D-look outline boxes.

The template editor uses a sort of style system as well. Parts of the window definition can be marked 'follow the usual style', and generic window styles can be set up. It's easy to ensure that if your application has ten different dialogue boxes that pop up, they all look much the same.

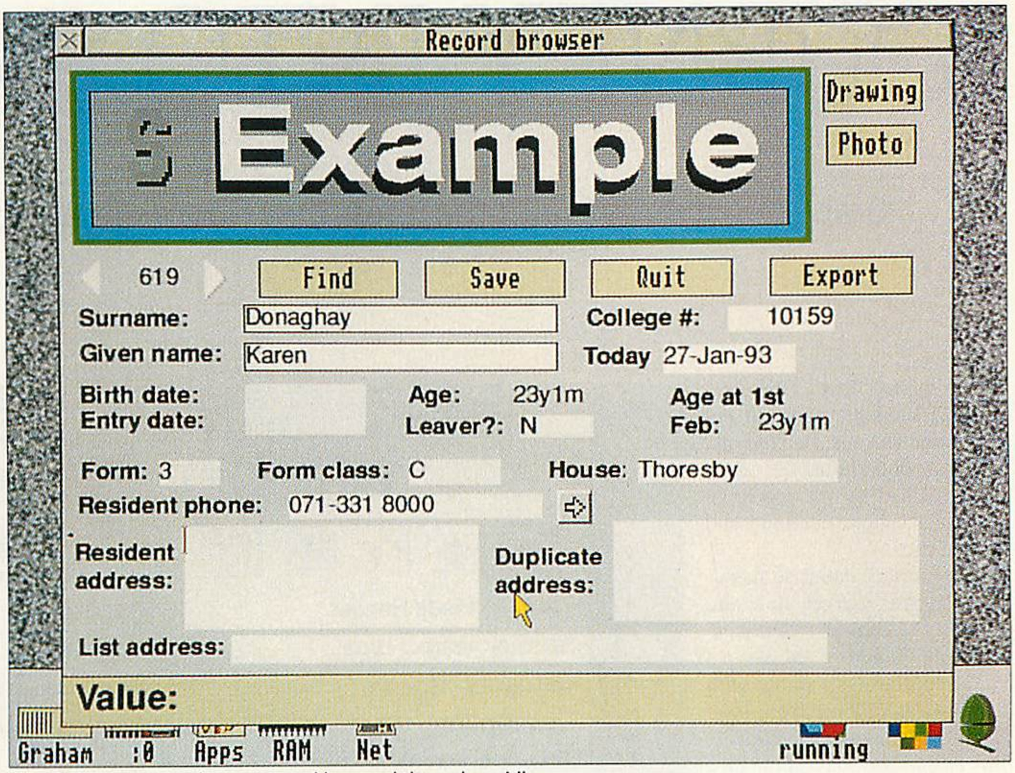
The format editor is quite similar: this defines how the data from your data file will appear in the window, overlaying whatever appears in the window template. You can do all the work of placing fields yourself, adding text prompts to name the fields and drawings and sprites to pretty-up the display. But a neat feature of *S-Base* is automatic format generation: you can select the fields you want displayed on the card and which window template it has to fit in, and it does the leg-work of creating most of the format.

The automatic layout is dull and tabular, but it's easy to move the fields and prompt text around. Again, there's a set of *Draw*-type tools to modify the format with.

S PROGRAMMING

So far, the process of setting up an *S-Base* database seems like an involved version of the routine for *Squirrel* or *Datapower*. But, with the latter database managers, you would now have a working database. In *S-Base*, the hard work is about to start.

For every *S-Base* application, there has to be a main program. It could do as little as display the first card in a database, wait a bit ('poll'), then end. And for each element on the card format data fields, prompt text, any sprites or drawings you add – you can define a 'handler'.



Simple databases can be set up, and browsed through rapidly

These are the direct equivalent of the event handlers that are the core of C programming under Risc OS: for every event – for example the database user clicking the mouse over one of the icons on a card – you have to write a mini-program to control what should happen. The event handlers have to deal with the nitty-gritty, like loading cards, saving any new data you type in, and so on.

S-Base provides the building blocks for these processes but no more: the onus is upon you to build into your application whatever functions you need. To write the programs in a high-level language called S, *S-Base* includes an *Edit*-like program editor. The major difference between it and *Edit* itself is that it can provide 'templates' of the common S structures like FOR . . . NEXT loops and CASE . . . ENDCASE statements: this reduces the number of silly syntax errors.

The tutorial is good in this area, helping you build an application bit by bit, and showing that it's particularly easy to add functions to your database gradually: you get one bit going before you worry too much about the next.

As well as cards, there are two other display modes: Table and Report. Table displays are much like a spreadsheet display of the data on several cards. Reporting is also very similar to creating a card display: you define a format layout, though reports use a page size rather than a window template as their basis.

And you can add headers, footers and design multi-column layouts. When a report is displayed or printed, a request entry event handler is responsible for loading the right data from the correct card in the data file and formatting it ready for use.

As an example of what could be done with an S program, you could define a button on the display or perhaps a menu option called Update. When clicked, this could run the update handler.

This could go through the database a card at a time, compacting the file and eradicating deleted records and moving fields about on the card. For example, a field for 'future booking' could be moved to a 'current booking' field, and the old 'current booking' moved to a 'old booking' field.

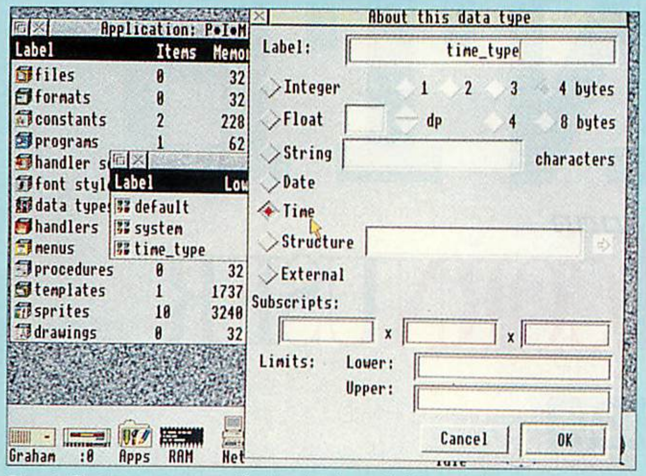
Finally a field called 'past bookings' could be incremented, and the modified data for the card saved. This sort of thing cannot really be done with the established Risc OS database managers.

The downside of all this control is the amount of effort required to get even the most simple database up and running: writing your own programs to browse through the records and ensuring that any new data cards you create are saved. You shouldn't underestimate the amount of code that has to be written, but S does allow you to add new code in small chunks.

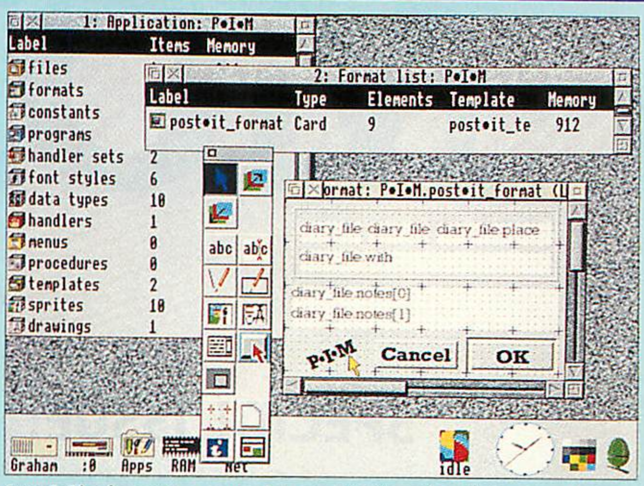
But, *S-Base* isn't aimed at running simple databases: the S programming language is able to access all the data in a file, and display it in any way you choose. Event handlers can use S functions to find out which icon has been clicked, or which card window closed. You can create and display menus. S can access more than one file at a time – this is the basis of the claim that *S-Base* is relational – and you can take full control of both the method of display of the data and the user's use of it.

S contains commands for all the usual control structures, REPEAT . . . UNTIL, WHILE . . . ENDWHILE and so on, and DEF PROC . . . ENDDEF procedures. You can declare any variables and arrays you need, and also access the data on a card in a file. There's a comprehensive set of functions for maths, statistics, trigonometry, string and

HOW TO DO IT



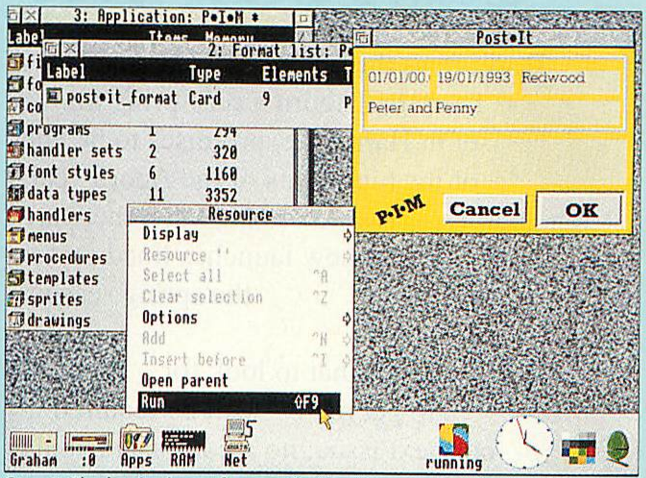
Step 1: First you must specify the database fields and their types. Strings are of fixed length, and paragraphs of text can be stored as arrays of fixed-length lines



Step 2: The formatting screen is a combination of a window template containing icons – such as the buttons and PIM logo – and fields to be used for data entry later on



Step 3: For each icon or field you can define a handler. The handler programs tell S-Base what to do when the user clicks on a particular part of the finished database card



Step 4: The beginnings of an application; here's what the appointment reminder looks like. S-Base Developer can compile this into a standalone application which can then be freely distributed

time calculations, and there are special commands for accessing data files through indexes or finding data in a field.

S-Base makes these normally complex things very easy, and Longman Logotron makes strong claims that the indexing system used is fast – certainly the demonstration applications were speedy, even before compilation.

END OF FILE

S-Base makes sophisticated Wimp application programming more approachable than raw C. The S development environment is well constructed. Most of the editors for data types, templates, formats and S code are integrated, so all you do is double-click on a resource in the resource list to edit it. Only sprites and drawings have to be exported to *Draw* and *Paint*. S code that you write can be tried out at once by choosing Run from the menu, and if the system discovers a problem, a dialogue informs you and gives immediate access to the relevant editor.

With the *S-Base* developer's edition, once your application is complete and tested, you can compile it and once compiled, it can be run independently of *S-Base* itself.

A compiled application isn't editable, and contains a royalty-free S runtime system, so it can be given away or sold to anyone. There is soon to be a server-based networked version too, which will allow several people access to the same data, in a similar manner to the *Squirrel* server system.

S-Base is in an interesting niche. Its emphasis is much more on 'database applications' rather than 'databases', along the lines of *Paradox* on the PC. It requires a level of commitment which, for the vast majority of casual database users, would not be appropriate.

But, for a sophisticated application, maybe one on which a business depends, using *S-Base* to develop it would be ideal. A payroll or accounting system would be typical. But you could also use it to build the front end for a CD-Rom. Small software companies and ambitious individual users will be able to use it to develop all sorts of tailor-made applications.

It doesn't have the user-level friendliness of *Squirrel* or *Datapower*: you can't whistle up a database with a few mouse clicks. It's really more like one of the application generators like *Archway*.

But it is programmer-friendly in • the way the resource editors are integrated and the interpreter works during development, and you can tailor every part of your application to exactly what you want. As a professional tool, £200 for the developer's version is a bargain.

PRODUCT DETAILS

Product: S-Base
Supplier: Longman Logotron, 124 Science Park, Milton Road, Cambridge CB4 4ZS
Tel: (0223) 425558
Price: Personal version: £99+VAT
Developer's version: £199+VAT

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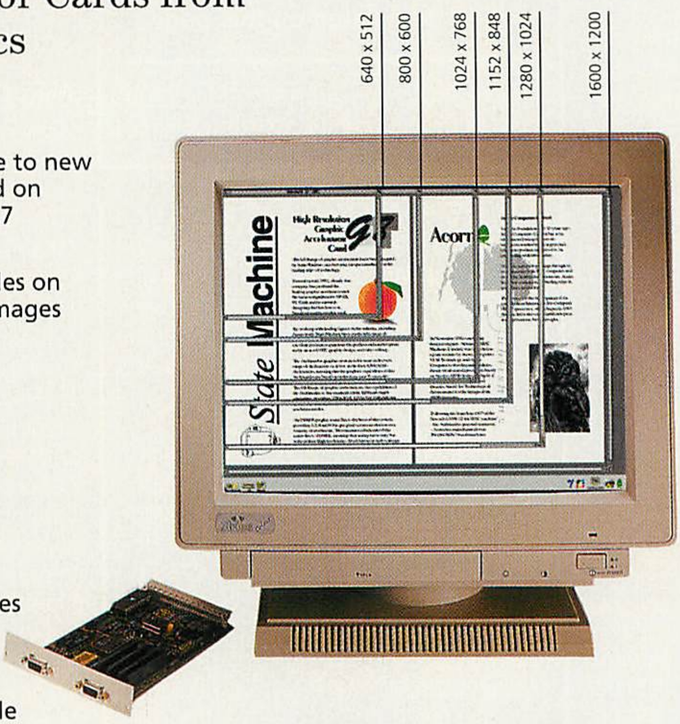
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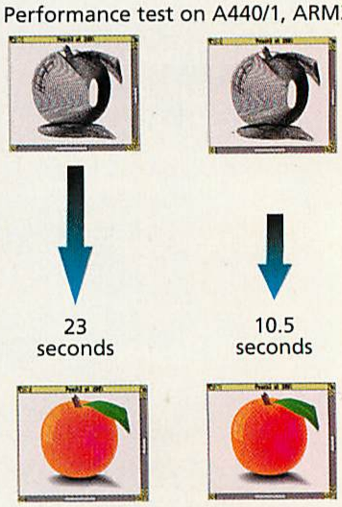
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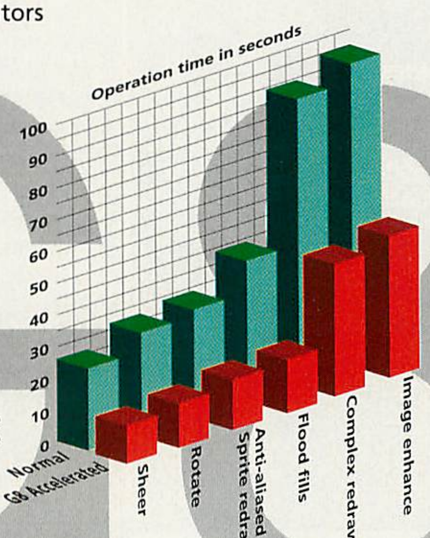
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Performance test on A440/1, ARM2





A comparison of speed performance between a standard A440/1 and one fitted with a G8 Accelerator Card from State machine.

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Maximum Resolution (Square Pixels)	1280 x 1024 @ 4 colours 1152 x 848 @ 16 colours 800 x 600 @ 256 colours
(Rectangular Pixels)	1600 x 1200 @ 16 colours 1152 x 848 @ 256 colours
V. Scan Frequency	*56-110Hz (NI), 87Hz (I)
H. Scan Frequency	*31.5-75KHz
Video Memory	512KB
Output Video Signal	Analogue RGB (RS-343A) Compsite grey level 15 and 9 pin connectors
Sync	H. Sync (TTL Level) V. Sync (TTL Level) Composite (TTL Level) Sync on Green
Palette	24 bit (16.7 million colours)

*Mode dependent, (NI) = Non Interlaced, (I) = Interlaced

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State Machine

75 Upper Wellington Street, Luton. LU1 5AA. (0582 483377)

* Add VAT and £5 for carriage

Watford Electronics Ltd

Established 1972

Mail Order & Showroom: Jessa House, Finway, off Dallow Road, Luton, LU1 1TR, England
Tel: 0582 48 77 77 Tlx: 8956095 WATFRD Fax: 0582 488 588

Showroom Only: Jessa House, 250 Lower High Street, Watford WD1 2AN, England
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The sign of Quality

Acorn — The choice of Experience

Shop Hours: 9am to 6pm (Mon.-Sat.) Thursday 9am to 8pm. FREE customer car park.
All prices exclusive of VAT; subject to change without notice & available on request.

Archimedes micro

System	Basic	Colour	Multiscan
A3010-1Mb Family	£424	£584	£749
A3010-2Mb L/C	–	£680	–
A3020-2Mb FD	–	£749	£799
A3020-2Mb HD60	–	£899	£949
A4000-2Mb HD80	–	£949	£999
A4000-Home Office	–	£999	£1049
A5000-2Mb HD80	–	£–	£1399
A5000-L/C 2Mb HD80	–	–	£1445
A5000-4Mb HD120	–	–	£1599
A5000-2Mb ES	–	–	£1299
A5000-2Mb NS	–	–	£1399
Pocket Book	£212	–	–
Pocket Book Class	£2127	–	–

On-Site Maintenance now available on all Archimedes Micros. Please telephone for details.

Archi A4 Notebooks

A4 Notebook with 2Mb RAM	£1399
A4 Notebook 4M RAM/60M HD	£1699

FREE OFFER

When you purchase any of the above Archimedes Micros, we will give 10% of the value of the machine in Hardware or Software of your choice

Archi Accessories

- 3.5" 800K 2nd Floppy Drive (305/310) £118
- 5.25" 800K external Floppy Drive £80
- Acorn I/O Podule (Analogue/User/1MHz bus) £79
- I/O Podule (Analogue/User) £49
- MEMC 1A Upgrade £29
- MIDI add-on to Acorn I/O Podule £27
- MIDI Expansion Card £65
- Econet Network Board £38
- Archi replacement mouse – New design £29
- PC Emulator v1.9 £95
- Software Developers Toolbox £149
- Floating Point Unit £455
- Keyboard Extension Lead £6
- 2 Podule Backplane £20
- 4 Podule Backplane £25
- Fan for above backplanes £10
- Risc Os Extras Software Disc £5
- Ethernet Card £149
- SCSI Card 8 bit £129
- SCSI Card 16 bit £149
- SID Utilities Discs – Set of 4 £19
- ST506 Hard Disc Controller Card £99
- A5000 Dust Cover £9pr
- A5000 Technical Reference Manual £65
- A4 Spare Batteries £49

RISC OS 3 Upgrades

- A 5000 Software Upgrade Kit £16
- Software Upgrade Kit for the rest £40
- Hardware Upgrade Kit 300/440 £25

A3000 Accessories

- 3.5" External Drive £95
- Monitor Stand £15
- Technical Manual £39
- Serial Upgrade £19
- A3000 Dust Cover £5
- Micro+monitor cover £9
- Acorn Carrying Case for A3000 £10
- A3000 User Port/Midi Upgrade Card £44
- A3000 User/Analogue/IIC I/O Card £38
- A3000 External Podule Case £15

Graphics Accelerator Cards

The ultimate G8 range of Graphics Accelerator Cards from State Machine, for the Archimedes micro give more resolution, colours and speed.

Features:

- Fully programmable 24 bit colour palette allows a choice of 16.7 million colours. True 256 grey scale, primary and VGA palettes supplied for enhanced dithering with RISC OS applications.
- DTP now easier with fully legible one or two A4 page screen display in 2, 4, 16 or 256 colours.
- At least 25 frames per second local VRAM update allows applications to run without flicker or tearing of the graphics.
- Provides 50 frames per second update mode 12, 15, 20, 21, etc., on 30KHz+ line rate monitors.
- Extends the high resolution mode 23 from 2 colours to 16 at the same resolution allowing A3000 and A5000 computers to use high resolution in up to 16 colours.
- 4 layer single width podule – no soldering required
- Full documentation and operating software supplied.
- Requires RISC OS 3.10.

P.S. Not compatible with A3010/20, A4000 & A4

G8 Pro additional features:

- Desktop compatible 768 x 576 CCIR PAL interlace in 256 colours
- 1Mb on-board VRAM
- External genlock facility
- G8 Plus £239
- G8 Professional £345

A3010 DTP Family Pack

Supplied with 3.5" Floppy Disc Drive and a mouse, Colour Monitor and lead, TV modulator, 20Mb fast IDE Hard Disk Drive, 'Compression' utility to increase the Hard Drive capacity to typically 40Mb, the highly acclaimed Computer Concept's Impression Junior DTP package, EasiWord wordprocessor, Quest for Gold game, applications suite of software packages and comprehensive audio training tape.

RRP: £1095

Sale Offer Price: £729

- A3010 DTP Family Pack with Learning Curve £829
- Additional 1Mb RAM fitted £29

Special Education discounts available on micros, RAM upgrades, ARM 3 Turbo Card, etc. Please write in or telephone:

0582 48 77 77

Archimedes RAM Upgrade

All our memory upgrades are simple to fit. No soldering required. Fitting instructions supplied.

- **R300**-4 Layer RAM upgrade board (Bare). £25
- **R302**-A3000 – to 2MB RAM Upgrade £29
- **R303**-A3000 – to 2MB RAM Upgrade (expandable to 4MB) £49
- **R304**-A3000 – to 4MB RAM Upgrade £99
- **R305**-A3010 – to 2MB RAM Upgrade £29
- **R306**-A3020 – to 4MB RAM Upgrade £50
- **R311**-A305 – to 1MB RAM Upgrade £30
- **R312**-A305/310 – to 2MB RAM Upgrade £115
- **R314**-A305/310 – to 4MB RAM Upgrade £229
- **R412**-A410/1 – to 2MB RAM Upgrade £25
- **R413**-A420/1 – to 4MB RAM Upgrade £50
- **R414**-A410/1 – to 4MB RAM Upgrade £75
- **R810**-A410/1 – to 8MB RAM Upgrade £579
- **R820**-A420/1 – to 8MB RAM Upgrade £549
- **R840**-A440/1 – to 8MB RAM Upgrade £479
- **A5000** – to 2MB additional RAM Upgrade £82

Desk Top Publishers

Acorn's Archi DTP Package	£69
Equasor £39; Expression-PS	£19
Impression 2 DTP Pack	£123
Impression Junior	£65
Impression Business Supplement	£39
Impression II Borders Disc	£19
Ovation DTP	£85

Archi Wordprocessors

Pendown Archi	£48
Pendown Plus	£68
Pendown Outline Fonts	£18
1st Word Plus – 2	£63
Pipedream Spell Checker	£40
Graphic Writer	£20
Easiwriter	£115
EasiWord	£58
Prime Word	£52

Databases

Flexifile	£79
Knowledge Organiser	£42
Magpie	£40
Multistore v2.01	£174
Pinpoint	£65
Pinpoint Junior	£23

Spreadsheets

Eureka	£99
Schema	£89

Business Graphics

GammaPlot	£39
Sigmaplot	£39

Integrated Packages

- Pipedream 3 £116
- Pipedream 4 £146
- Desktop Office – Database, Graphs & Charts, Wordprocessor Spreadsheet, Communications £98
- Desktop Folio – Wordprocessor, Desktop & Interactive Publishing. Ideal for school £75

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Hi-Speed, Low Cost Archi Hard Disc Drive

Watford's advanced interface allows IDE drives to work on any Archimedes machine, speeds in excess of SCSI devices can be obtained at a fraction of the cost of a SCSI drive.

Up to four drives are supported by the IDE filing system IDEFS, up to two drives can be attached to each expansion card, up to four cards can be installed in a machine. An optional 20Mb or 40Mb hard disc can be supplied on the podule expansion card itself, with its fast transfer rate and power saving modes the drive is ideal for storing commonly used software such as the !Fonts application.

A powerful security feature has been provided with the two unique commands *IDELock and *IDEUnlock, ideal for educational establishments where hacking or tempering may be prevalent that may lead to loss of data. Once locked, the configuration can not be changed until a secret password is used. The !IDEForm Write Protect option is particularly useful in conjunction with *IDELock as it will prevent any unauthorised deletion of data.

By an innovative use of on-board memory, the card will remember its configuration, even if moved to another slot or even a different machine, this also includes the unique security features.

Hardware

- Single width EuroCard
- Supports proposed ANSI ATA (IDE) specification
- Fast 16 bit MEMC interface interrupt driven to support background disc operations
- 5 Mbytes per second peak transfer rate
- Optional on-card 20Mb or 40Mb hard disc
- Up to two drives (master and slave) per card
- Multiple cards per machine (up to four)

Software

- Conforms fully to the Acorn IDE Specification
- All software supplied in ROM
- Filing system 'IDEFS'
- Desktop filer with drive ready detection and disc name under icon
- !IDEForm, WIMP based configuration and formatting software
- Drives can be individually write protected
- Up to four drives over multiple cards
- Power saving standby modes supported with configurable timeout
- Drives can be used without translation in native mode for minimum overhead
- !IDEFSDisk, creates PC emulator hard discs

Prices

Part No.	Capacity	Access Speed	Price
ADA 0520	44Mb	28mS	**£195**
ADA 0530	100Mb	16mS	**£295**
ADA 0570	200Mb	15mS	**£449**
ADA 0580	330Mb	15mS	**£799**

All the above 3.5" hard drives are supplied complete with Controller Card, cable & Software on ROM. (Internal fitting). For use with A300/A400/A500 series machines.

AAA 0300 External Case & PSU for A3000 **£85**
AEA 1060 Archi IDE Hard Disc Podule only **£89**

Internal Hard Disc Drives for A3000

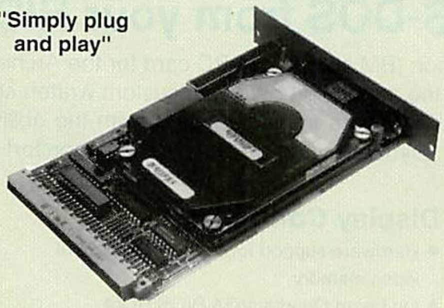
State of the art, 4 layer internal IDE Hard Cards for the A3000. Software supplied in, On-board ROM.

ADA 0150	20Mb	19mS	**£149**
ADA 0770	30Mb	19mS	**£185**
ADA 0710	40Mb	19mS	**£279**
ADA 0750	60MB	18MS	**£329**
ADA 0720	80Mb	18mS	**£399**
ADA 0730	120Mb	16mS	**£POA**

Supplied ready assembled. No soldering required. Simply plug into the allotted space.

Archi IDE Hard Cards

"Simply plug and play"



Watford's easy to instal, low cost, high performance, revolutionary IDE Hard Cards for the A300 & A400 series Archimedes.

ADA 0650	20Mb	19mS	**£159**
ADA 0800	30Mb	19mS	**£185**
ADA 0660	40Mb	28mS	**£289**
ADA 0810	60Mb	18mS	**£339**
ADA 0670	80Mb	18mS	**£409**

Also available 120Mb and 180Mb Cards.
Please telephone for prices.
(All above Hard Cards can be used as Removable Hard Drives)

Archimedes A300/A400 SCSI Hard Disc Offer
(while stocks last)

100MB Hard Disc Upgrade complete with Controller card, Cables, Formatter and Manuals

RRP: £799

Offer Price: £325

Also available with 16-bit controller **£359**

Low Cost Finance now available on Archimedes. Please telephone for details.

Archi to BBC Serial Link Mk 2

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.
New RISC OS Version also available (please specify)

- For A3000 **£15**
- For A5000 **£16**

For A3000 Serial Upgrade **(£19)** required

A3000 I/O Card (User, Analogue & IIC)

This NEW versatile I/O Card from Watford, fits inside the A3000 and includes an Analog to Digital Converter, a User Port, and an InterIC (IIC) connector.

The card allows many of the peripherals developed for the BBC to be used with the Archimedes A3000. The ADC and User Port have the same pin out and connectors as the BBC computers.

Extensive RISC OS software is supplied to provide BBC OSBYTE calls for support of the ADC and User Ports, including the BASIC keyword ADVAL. The software provides extended RISC OS support for separate interrupts from both the ADC and User Ports, permitting easy interrupt driven operation.

The card is provided with all the software in ROM and is automatically loaded when the machine is turned on.

Peripherals connected to the ports can obtain up to 500mA of power at +5V. A fuse is fitted to the card to protect the A3000 from damage arising from accidental short circuit of the power output.

Features

- An 8 bit User Port with a standard 20 way IDC connector, compatible with the User Port on the BBC computers and the Archimedes I/O Podule.
- A 10 bit Analog to Digital Converter with a standard 15 way D type connector, compatible with the ADC on the BBC range of computers and the Archimedes I/O podule.
- An InterIC (IIC) Port with a 5 pin DIN socket to connect the A3000 to external IIC devices. **£38**

Archimedes External Disc Drive Interface

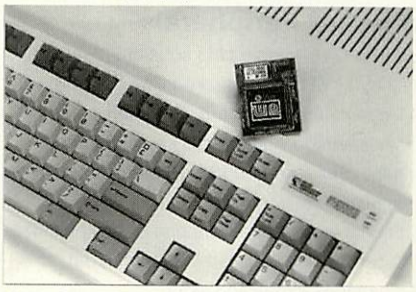
With this interface it is possible to connect almost any 5.25"/3.5" disc drive with its own power supply to the Archimedes. Upto 4 disc drives can be connected. Fully Buffered Board. NO SOLDERING is involved. Supplied complete with necessary lead.
Price £21

Back Plate Extension

- A300/400 **£15**;
- A3000 **£14**

ARM 3 Turbo Card MkII

Simply The Best



Here it is at last – the all new Mark 2 version of Watford's highly acclaimed ARM 3 processor board for the Archimedes and now also the A3000 series computers. Using the latest surface mount technology on a high quality four layer circuit board we have reduced the overall size to a mere 53mm x 45mm, and the cost to only £169. Mk II upgrade will increase the speed of your micro by a factor of 3 to 6.

Any competent A300 or A400/1 series micro owner can fit the upgrade himself, as we provide full fitting instructions and a special ARM chip extraction tool. However for A3000 micros and those not wishing to perform the upgrade themselves, we will collect, upgrade and return your micro by courier service, at an additional cost of £24.

(A300 and old A440 series owners please note – you will need to upgrade to MEMC1A for ARM3 to work.)

RRP £249

Special Offer £145

Acorn have satisfactorily evaluated Watford's ARM 3 upgrade and the A3000 upgrades are fitted by Acorn approved surface mount technology centre, therefore its fitment will not invalidate Acorn's warranty on the micro.

BBC MASTER

MASTER 128K Micro incl. Acorn's View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus FREE OFFER (see below) **£329**

Add-Ons & Accessories

Econet Module for the Master		**£42**
Twin ROM Cartridge for Master		**£9**
Quad ROM Cartridge for Master		**£14**
Master Reference Manual I	(No VAT)	**£14**
Master Reference Manual II	(No VAT)	**£14**
Master Advance Ref Manual	(No VAT)	**£14**
64K Upgrade Kit for B+		**£32**
ECONET Upgrade Kit for BBC B		**£42**
ALL ECONET UPGRADES Available		
ARIES' IEEE Interface for BBC B & Master		**£238**

Leasing finance at very attractive rates now available to Businesses (subject to status), Schools, Colleges, Universities, Government Depts. and Local Councils. Minimum order £1,000. Please telephone for details.

Continued→ → → → → → → → → →

Watford Electronics Aries PC Card

Access the world of MS-DOS from your RISC OS based computer

Watford Electronics brings you a full specification IBM compatible PC card for the Archimedes. You no longer require the Archimedes PC Emulator, all PC software is run locally on the expansion card with custom written software to interface the PC card into the RISC OS environment. The expansion card is a full hardware implementation, with the ability to be turned into an ISA Bus, fully fledged 386 PC just by the addition of a power supply, keyboard, storage device and a monitor!

Processor

386SXL 33MHz low power processor. Socket for optional 387SX 33MHz numeric co-processor.

On Board Peripherals

- Uses 82C107 single chip solution.
- 128 bytes of battery backed CMOS RAM.
- AT compatible Keyboard Controller.
- Uses standard Archimedes keyboard and mouse. Full standard ISA 16 bit expansion bus available.
- Optional expander allows one or two half size PC cards to be installed in the adjacent Archimedes expansion slots.

Memory

- Uses 82C311 memory controller 2Mb zero wait state DRAM as standard, upgradable to 4Mb DRAM just by adding 4 more chips.
- Bank interleaving and page mode memory operation for maximum performance.
- On-board BIOS ROM.

Display Controller

- Hardware support for VGA with 512Kb of video memory.
- On board Quadtel VGA BIOS ROM.
- Multitasking screen display on RISC OS.
- Desktop can be achieved in software.
- Separate VGA monitor can be connected for simultaneous RISC OS and PC display or your Archimedes VGA compatible monitor can be used with optional video switch.
- Much faster and improved video speed compared to PC Emulator.

Hard & Floppy Disc

- Full background disk access, the Archimedes is not adversely affected.
- Any existing Acorn PC Emulator hard disk partition can be used, with the ability to create new PC hard disk partitions on any RISC OS hard disk.
- Optional IDE hard disk and floppy drive option for direct connection of a dedicated hard disk and floppy to PC card.
- Access to the Archimedes floppy disc drive for reading and writing of PC disc formats from PC.

Bundled Software

- MS DOS 5.0, Lotus Works and PC Organiser

Sound

- Uses the Archimedes internal speaker by connecting to the Auxiliary sound connector.

Enhancements

Optional expansion card will be available either hardware parallel and serial ports or the ability to connect an external AT style keyboard and mouse.

The PC card can also be plugged into a stand alone backplane to form the heart of a fully expandable, industry compatible 386SX computer, with no reliance upon the Archimedes.

Specifications may be subject to change. E&OE.

Why not visit the Acorn Village in our Computer Boutique at our Luton HQ for a demonstration

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Scan256 – The only sensible scanner purchase

Scan256 – the innovative 256 grey-level hand scanner for the Archimedes range of micro computers. It offers up to 256 grey levels at a maximum of 400 dpi, and comes complete with the most advanced and sophisticated 256 grey scale scanner software currently available for the Archimedes.

- Multiple copies of the image in memory at once.
- Allows multiple consecutive operations without having to save the original image to disk.
- Instant re-draw of all 4 image buffers.
- No re-calculations needed unlike other packages that use on the fly screen-dithering.
- Highly advanced dithering and image size reduction.
- Available via industry standard Change FSI package for maximum image quality. An invaluable aid to reduce the size of the image whilst maintaining maximum image quality.
- Advanced in-built image processing options.
- Convolution digital filtering fully implemented with over 100 filters covering edge detection, image enhancement and image smoothing. Enables high quality images to be obtained from poor quality scans.
- A unique L.E.D. indicator on the scanner.
- Shows you when the scanner is being moved at close to the maximum scanning speed, not just when it is too late and a scan line has been missed by moving the scanner too fast.
- Fully adjustable scale and size of image preview when scanning
- Hand held scanner image preview window can even be behind other windows and preview is shown in real-time with maximum number of grey-scales available.
- Support for The Serial Port Graphics Enhancer.
- Forthcoming support for the State Machine G8 Graphics Card.
- Allows up to 256 simultaneous grey scales on screen at once.
- True brightness, contrast and gamma correction.
- All can be specified by a value to exactly match monitor/printer. No guessing with shapes of curves and correction is mathematically correct.
- RISC OS 3 features.
- Include rotation and shearing. Scans normally are scanned at a slant rather than being rotated, shearing enables the scan to be corrected better than rotation.
- Fast RISC OS printing.
- Multiple options such as scale to page, centre, sideways selected area, and any scale.
- Scanner scans at an amazing 3ms per line.
- A post card at 400dpi takes only 7.3 seconds to scan, creating over 3Mb of data.
- Selectable scanning modes.
- 256 grey-scale, 256 grey-scale half width, 16 grey-scale and monochrome scanning modes. Half width mode enables longer 256 grey-scale scans to be achieved.
- Save image foreign formats.
- Save as industry standard TIFF for exporting to other systems, AIM for further processing, or RISC OS Sprite format.
- Single width, high quality podule using surface mount technology

The only sensible scanning and image processing solution for the Acorn Archimedes. Just compare the features, there can only be one choice...

Scan256 Scanner, Interface Card, Software and Manual Only £185

Please specify Archimedes type.
Not compatible with A3010, A3020, A4000

Call now for details about our new Scan256 Flatbed Professional Scanner

BBC Education Software

A vous la France	French programs for beginners	£29
Au restaurant/Accident de route	French games for 12 years +	£26
Bolougne and oh les	French program for beginners	£26
Computer control	Program simulating computer control	£26
Computers at work	Primary education program	£17
Espana Viva	Spanish educational programs	£20
Folks Tales	Listening and reading for ages 7+	£22
Geordie Racer	Look and read for ages 7+	£22
Hall of Mirrors	Practice word & number skills	£22
Help your child learn basic mapwork 2		£18
Inside Science	Four common science subjects	£22
Letters and pictures	Educational programs for 6-8 years	£15
Make a wildlife garden	Explore wildlife/weather/garden growth	£22
Maths with a story 1	Primary level maths programs	£20
Maths with a story 2	4 further maths programs	£20
Note invaders	Learn sheet music for 7-Adults	£15
Numbers & Pictures	Early number learning (4-6 years)	£15
Picture craft	Geometrical design & Colouring	£17
Puncman 1 & 2	Learning Punctuation (7-13 years)	£15
Puncman 3 & 4	Learning Punctuation (8-14 years)	£15
Puncman 5, 6 & 7	Learning Punctuation (8-15 years)	£15
Ramayana Tales	Simple Desktop Publisher using pictures & characters from the Ramayana	£22
Skyhunter	Look and read educational adventure	£22
Technology and design	Problem solving programs	£22
Through the dragons eye	Adventure game and Map reading	£22
Fun School 3 (Under 5)	Varied range of Education subjects	£17
Fun School 3 (5-7)	Varied range of Education subjects	£17
Fun School 3 (Over 7)	Varied range of Education subjects	£17

Archi Educational Software

- Animated Alphabet (3-6 yrs) £21
- Arcventure (8-12 yrs) £29
- Bookbinder £43
- Bumper Disc £14
- Bumper Disc 2 £14
- Craftshop 1 £26
- Craftshop 2 £26
- Converta-Key £16
- Data Word £16
- Desktop Stories £35
- DigiSim £35
- Dream Time (5-7 yrs) £23
- Farm (5-7 yrs) £19
- Fleet Street Phantom (9-13 yrs) £25
- Fun School 3 Red (up to 6 years) £17
- Fun School 3 Green (6-8 years) £17
- Fun School 3 Blue (8 years +) £17
- Gate Array Teaching System £68
- Glimpse Clip Art Utility (7-16 yrs) £8
- Highlighter (6-16 yrs) £42
- Jigsaw £28
- Mapventure (9-13 yrs) £24
- Microbugs £24
- Money Matters £16
- Nature Park Adventure (7-9 yrs) £27
- Numerator £60
- Picture Book £16
- Recall (6-13 yrs) £39
- Sellardore Tales £24
- Snippet £26
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- Sting of the Dump (9-13 yrs) £22
- Target Maths £16
- Viewpoints (9-12 yrs) £33
- Wizard's Revenge (7-10 yrs) £17
- Worst Witch (7-10 yrs) £25

Archimedes Software

GRAPHICS

3D Construction Kit	£39
Arc Light	£46
ARCtist	£19
ARCticulate	£19
Art Works	£139
Atelier	£60
Artisan II	£45
Artisan Gallery	£16
Autosketch II	£65
CADet (CAD)	£140
Clip Art Set 1	£28
Clip Art Set 2	£28
Concept Designer	£23
Craftshop 1 & 2	£28
Euclid 2	£50
Graph Box	£59
Graphbox Professional	£107
HotLink Presenter	£40
Illusionist	£69
Kermit	£46
Mogul	£17
PCAD Educ.	£395
Poster	£79
Pro Artisan	£70
ProCAD	£475
Prime Art	£46
Render Bender 2	£79
Revelation 2	£80
Snippet-New	£32
Titler	£119
Tween	£29

GAMES

Air Supremacy	£17
Apocalypse	£14
Arcade 3 Compilation	£12
Battletank	£10
Black Angel	£27
Boogie Buggy	£14
Break 147 + Supa Pool	£19
Bughunter in Space	£12
Bughunter/Moondash	£10
CADet	£135
Casino	£10
Cataclysm	£19
Caverns	£10
Chess 3D	£16
Chocks Away	£27
Compendium	£32
Chocks Away Extra	£14
Chuck Rock	£18
Conqueror	£15
Corruption	£18
Cyber Chess	£38
Ego Repton 4	£–
Elite	£33
Enter the Realm	£19
E-Type Compendium	£20
E-Type Designer	£13
Family Favourites	£13
Galactic Dan	£19
Gods	£24
Grievous Bodily Arm	£19
Holed Out Designer	£13
Holed Out Golf Comp	£20
Hostages	£14
Inter Dictor 2	£26
Iron Lord	£15
Jahangir Khan Squash	£19
Jigsaw	£27
Lemmings	£20
Oh no more Lemmings	£15
Lost Temple	POA
Lotus Turbo Challenge	£19
Mad Prof Mariarti	£17
Masterbreak	£16
Man at Arms	£14
MahJong Patience	£15
Manchester United II	£19
Mig 29	£24
Nebullus	£21
Nevryon II	£20
Omar Sharif's Bridge	£23
Pandoras Box	£18
Pipe Mania	£17
Play It Again Sam	£–
Populous	£23
Puncman 1 & 2	£16
Puncman 3 & 4	£16
Pysanki	£14
Quazer	£10
Real McCoy 2	£23
Real McCoy 3	£22
Redshift	£14
Return to Doom	£16
Repton 3	£14
Saloon Cars Deluxe	£27
Sim City	£19
Spitfire Fury	£22
Splice	£25
Sporting Triangles	£24
Superior Golf	£14
Superpool + Break 147	£22
Swiv	£19
Talisman	£12
Timewatch	£24
Trivial Pursuit	£22
Twin World	£15
U.I.M.	£23
White Magic 2	£15
Worldscape	£16
XFire	£19
Zelanites	£23

Miscellaneous

Ancestry	£59
Arccomm 2	£38
Arcterm 7	£64
Armadeus Sound	£60
Avante Garde Fonts	£23
BBC DFS Reader	£6
Broadcaster Loader	£65
Chameleon	£34
Chatter	£34
Compression (CC)	£38
Craftshop 1	£27
Craftshop 2	£27
Equasor	£38
FlexiFile	£97
Genesis Plus	£68
Genesis 2	£99
Investigator 2	£22
Magpie 2	£42
Notate	£42
Numerator	£66
Pin Point	£65
Presenter 2	£29
Presenter Story	£145
Prophet Accounts	£132
Prophet Demo Disc	£10
Rainforest	£17
Revelation 2	£95
Rhapsody in Blue 2	£45
Score Draw	£46
Show Page	£127
Speech!	£15
The Victorian	£17
Time Tabler	£549
Toolkit (Clares)	£35
Touchtype	£40
Tracker	£39
Turbo Driver BJ10E	£42
Vox Box	£46
WorldScape	£17

LANGUAGES

Desktop C	£199
Macro Assembler	£40
Robo Logo	£69
BASIC Compiler	£77
Logotron Logo	£45
Risc BASIC	£120
Risc FORTH	£110
Cambridge Pascal	£95

Minerva's Archimedes Software

EasyWord	£18
Home Accounts	£35
Time Tabler	£549
System Delta	£59
System Delta Program Reference Manual	£29

Stand alone Business Accounts Packages
Sales; Purchase; Order Processing and Invoicing; Nominal; Stock management
£79 per module
or Complete Business Package **£325**

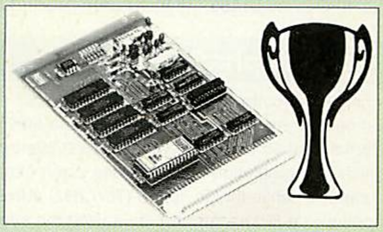
Cortian CKAI Interface

Eliminates the need to have a User port in A3000, A5000 and any other Archimedes without User Port. Fits to the Econet socket. **£29**

Concept Keyboards

- A4 Standard Pack £95
- A4 Primary Pack £100
- A4 Designer Pack £110
- A3 Standard Pack £99
- A3 Primary Pack £105
- A3 Designer Pack £110
- Universal 2010 Keyboard A3 £115
- Universal 2010 Keyboard A4 £110

Archi Real-Time Digitiser



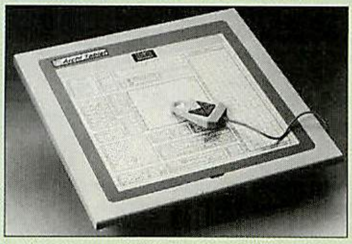
Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £99

A Set of Colour Filters for colour image grabbing using a video camera **£16**

Archi Graphic Tablet



Special Price £199

(Price includes Tablet, Leads, Software & Puck)
Stylus Optional Extra **£20**

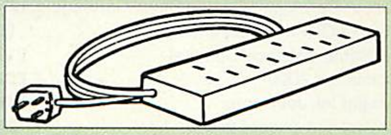
Archi Graphic Tablet Junior. Working area 9" x 6". Price includes Stylus **£105**

Surge Protector Plug

Fitted in place of your normal mains plug, this device protects your equipment (and data from corruption), against mains high voltage translent spikes/surges caused by lightning or thermostats switching.

Protection for only **£8.50**

4 Way Mains Distribution Socket



4 way top quality mains trailing sockets.
Supplied wired up with mains plug ready for use.
Can be screwed to floor or wall if required.
Very useful for tidying up all the mains leads from your peripherals.

£9.50

Aries Spike Cleaner Unit

A 4 way mains distribution unit as above with a built-in Surge Arrester, providing protection for your complete Computer/Hi-Fi System

£16

Microvitec Monitors

• **1431** – Standard Resolution Monitor	#£169
• **1451** – Medium Resolution Monitor	#£209
• **Cub3000** Medium Res for A3000	#£189
• Dust Cover for Microvitecs	£5.50
• **Touchtec 501 Touch Screen**	£239
• **Touchtec 3000**	£–

Includes 3 years parts & labour warranty

Multiscan Colour

• Eizo F550i	£726	• Taxan 787	£225
• Eizo T560iT	£1319	• Taxan 787LR	£245
• Eizo T660i-T 20"	£1615	• Taxan 795PC	£415
• NEC 3FG	£345	• Taxan 875	£715
• NEC 4FG	£442	• Taxan 875+	£745
• NEC 5FG	£827	• Taxan 970	£1195
• NEC 6FG	£1485	• VIDC Enhancer	£25

Aries AlphaScan Monitor

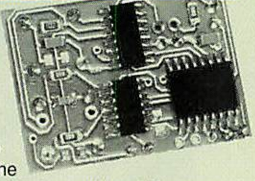
Its multiscan circuitry provides automatic adjustment for frequencies between 30 and 60KHz horizontal, and 50 and 90Hz vertical. Its 0.28mm dot pitch high resolution tube provides super sharp text graphics, while a high speed (70/72Hz) refresh rate provides a flicker-free display easing the eye strain. The VIDC Adaptor supplied with the monitor allows high resolution operation in all screen modes. **£325**

• Aries Alphascan 17" Plus **£545**

Philips Monitors

• **BM7502** 12" Hi-res Green Monitor	£82
• **CM8833** 14" Med. Res Colour Monitor	£185
• Dust Cover for Philips Monitors	£6
• Spare Monitor Leads (various)	£7

VIDC Enhancer



This unique VIDC add-on board for the Archimedes, caters for all types of Multiscan and VGA monitor and mode requirements. There are 2 versions to suit all requirements. The multimode software supplied, provides all the new modes for the selected monitor type, including the now standard Computer Concepts modes. With VGA monitor, you are no longer restricted to a few modes. A Desk Top application supplied on disc, allows new modes to be designed and existing modes to be modified for particular monitors.

Super VGA VIDC Card: Its unique design allows the horizontal and vertical sync to be buffered and have the polarity changed under software control **£45**

MultiVideo VIDC Card: As above but for MultiScan monitors only. **£25**

Integrex Ink Jet Printers

• Colour Jet 132 Printer	£425
• Paper Roll	£6.50
• BBC Screen Dump Software	£10
• Colour Cartridge £21 • Black Cartridge	£12.40
• 100 A4 OHP transparencies	£55
• 8K Serial Interface Optional	£123
• Colour Jet 2000	£529
• Betajet Ink Jet Printer	£185
• Betajet Cut Sheet Feeder	£43
• Integrex Colourjet Series 2	£335

Printer Leads

• BBC Centronics 4'	£5;	6'	£6
• Archi Parallel 2m	£5; 5m £9	10m	£13
• PC Parallel 2m	£5; 5m £9;	10m	£13
• 25 pin D Male/Male	2m £5;	5m	£10
• Centronics Double Ended 4'			£5
• Centronics Double Ended 6'			£6
• RS232 Leads Various			£POA

Star Printers

LC15	£168	LC200 Colour	£143
LC20	£98	SJ48 Inkjet	£160
LC100 Colour	£126	XB24-200 Colour	*£288
LC24-15	£233	XB24-250 Colour	*£350
LC24-20	£148	XB24 Colour kit	£29
LC24-100	£142	ZA200 Colour	*£230
LC24-200	£162	ZA250	*£295
LC24-200 Colour	£203		

• Star/Archimedes Colour Printer Driver **£15**

* Includes 12 months On-site warranty

Cut Sheet Feeder

LC10/200/24-10	£49	LC15/LC24-15	£119
XB24-10	£80	XB24-15	£139
XB24-200	£99	XB24-250	£149

Serial Interfaces

8K Ser LC-200; LC24-200; FR10; FR15; XB24-10; XB24-15 **£52**

Buffers

32K Ram Card for LC/XB24-10; 15; LC200	£55
32K Ram Cartridge for LC24	£54

Star Printer Ribbons

LC10; LC10-II; LC15	Black £4;	Colour £6
LC-200; LC24-200	Black £5;	Colour £12
XB24-10; XB24-15	Black £5;	Colour £12
• Dust Covers for Star Printers		£6

NEC Pinwriter Printers

• P20#	£169	• P70	£396
• P30	£235	• P90	£589
• P62	£POA		

• P60/70 Colour Option Kit **£59**
• Ribbons Black for P20; P30 **£6**
• Ribbons for P60/70/90 Black **£8** Colour **£13.50**

Includes 12 months on-site warranty

Cut Sheet Feeders

P20 **£59;** P30 **£85;** P60/62 **£89;** P70/90 **£80**

Panasonic Printers

KX-P1123	£126	KX-P2624	*£268
KX-P1170	£98	KX-P2123M	£165
KX-P1624	£250	KX-P2123C	£195
KX-P1654	*£330	KX-P2180M	£127
KX-P1695	£267	KX-P2180C	£145
KX-P2124	£215		

*** Price includes 12 months On-site warranty**

Cut Sheet Feeders

P36 – 1124/24i **£69** **P37** – 1123/70/80 **£59**
P38 – P1624/95; P2624 **£126**

Buffers

P12 4K Buffer Board for KX-P1081 **£55**
P14 32K Buffer P1123/24/70/80 P1540/92/95; P1624/54/95 **£16**

Serial Interfaces

P13 for all above printers **£46**

Original Panasonic Ribbons

Guaranteed to last 3 million characters

• for P1081, 1180, 1123, 1124, 1170 **£6**
• for P1624, 1695, 2123/24, 2180, 2624 **£8**

• Colour Ribbons for KX-P1081, 1592 & 1595 Brown, Blue or Red **£9 each**
• **P150C** Colour for P2123/2180 **£15**
• Dust Covers for all 80 column Panasonic Printers **£5**

Citizen Printers

• 120D+	£98	• Swift 200	£178
• Swift 9	£145	• Swift 240	£200
• Swift 9X	£185	• Swift 240C	£212
• PN-48	£189	• Swift 24X	£299

• AH29804 Manual Cut Sheet Feeder for Swift 9/24/124. Holds 50 Sheets **£29**
• Cut Sheet Feeder for 80 col. printers **£75**

+ FREE 2 years Parts and Labour warranty on all Citizen Printers

• Swift 9 Colour Option		£19
• Swift 24 Colour Option		£29
• Swift 24 Ribbons	Black £4	Colour £13
• Swift 24X Ribbons	Black £8	Colour £16
• Citizen/Archimedes Colour Printer Driver		£15

Laser Printers

All Laser Printers include 12 months On-site maintenance

Brother HL4-VE	4ppm	£549
Brother HL4-PS Postscript	4ppm	£970
Brother HL8-V	8ppm	£894
Brother HL-10V	10ppm	£1045
Brother HL10PS	10ppm	£1329
Brother HL10DV	10ppm	£1149
Brother HL10DPS	10ppm	£1449
Canon LBP4 LITE	4ppm	£479
Canon LBP4+ 1.5M RAM	4ppm	£632
Canon LBP-8III Plus	8ppm	£945
Canon LBP-8 plus IIIR	8ppm	£1435
Epson EPL4300	6ppm	£566
Epson EPL4000	6ppm	£475
Epson EPL5200	6ppm	£599
Epson EPL7500	6ppm	£1139
Epson EPL8100	10ppm	£920
Fujitsu VM800 (Best Buy)	8ppm	£685
HP Laserjet IIP+	4ppm	£530
HP Laserjet IIID	8ppm	£1482
HP Laserjet IIIP	4ppm	£597
HP Laserjet IIISi PS	16ppm	£2419
HP Laserjet IV (600 dpi)	8ppm	£989
HP Laserjet 4M PS	8ppm	£1369
NEC Silentwriter S62P P/script	6ppm	£994
NEC Silentwriter 266	8ppm	£669
NEC Silentwriter 290P P/script	8ppm	£1369
NEC Silentwriter S102	8ppm	£989
OKI OL400	4ppm	£440
Panasonic KX-P4410	5ppm*	£449
Panasonic KX-P4420	8ppm*	£615
Panasonic KX-P4430 Satin Print*	5ppm*	£575
Panasonic KX-P4451	11ppm*	£895
Panasonic KX-P4455 Postscript	11ppm*	£1249
Star LP-8 III 2	8ppm	£1249
Star LP-8 III	8ppm	£890
Star LP-8 Star(post)script	8ppm	£1130
Star LS-5 (RISC Based)	5ppm	£489
Star LS-5 EX	5ppm	£599
Star LS-5 TT True Type + Mac	5ppm	£799

* Now with 2 years On-site warranty

Laser Toners

Canon 2, 3 & 4	£46	Laserjet HP IIP & IIIP	£42
Epson GQ	£13	Laserjet II/D, III/D	£48
EPL4/41/4300	£55	Laserjet 4 & 4M	£75
EPL7100/7500/ 8100	£117	NEC SWriter	£78
		Star LP4/LP8	£42
KX-P4420/50/55	£20	Qume Crystal (3)	£58

Laser RAM Upgrades

IIP; III/P 1Mb	£49	Canon LBP8 2M	£125
IIP; III/P 2Mb	£80	EPL7100 256K	£39
IIP; III/P 4Mb	£132	GQ5000 512K	£42
II & IID 1Mb	£60	KX4420/50i 1M	£75
II & IID 2Mb	£96	KX4420/50i 2M	£115
II & IID 4Mb	£142	KX4420/50i 4M	£195
HP4 2Mb £73; 4M	£115	Star LP8 1M	£139
Canon LBP4 1M	£105	Star LP8 2M	£275

Laser Drum & Developer

• Epson Drum GQ5000	£93	EPL7100	£129
• Panasonic 4420 Drum	£60	Developer	£80
• Panasonic 4450 Drum	£93		

Jetpage Postscript Cartridge

• HP IIP/III **£225** IID & IIID **£227**

Various Add-Ons

• HP Adobe costscript + Cartridge	£359
• HP Premier Font Collection	£28
• Laserjet various Font cartridges	from £45
• Canon LBP-4 Lower Cassette Tray	£75
• HPIIP/IIP Lower Cassette Tray	£96
• Laserjet 4 Powered envelope feeder	£199
• LP4 500 Sheet paper cassette 3rd Bin	£205

Laser Direct

P.S. We have now discontinued Laser Direct as the Hewlett Packard Laserjet 4 printer offers better facilities at a lower price. See above.

Hewlett-Packard Printers

DeskJet 500	#£255	DJ500 colour	#£325
DJ550 colour	#£415	Paint Jet	+£495
Paint Jet XL	+£1045	PaintJet XL300	+£1529
QuietJet	+£293	PJet XL300 PS	+£2475

+ Includes 12 months on-site warranty
Includes 3 years extended parts & labour warranty
- For additional £49, we will convert above 3 years warranty, to 3 years on-site maintenance warranty
- Paintjet Cartridges Black **£13;** Colour **£22**

Desk Jet 500 Accessories

- 256K RAM Cartridge **£69**
- HP Epson FX Emulation Cartridge **£45**
- DeskJet 500 Cart. Black **£12;** Colour **£20**
- High Capacity Black Ink Cartridge **£17**
- DJ500 Colour Archimedes Printer Driver **£15**
- Dust Cover **£6**
- DJ500 does not require Archimedes Driver
- 636G 50 x Transparencies A4 **£32**
- 636J 50 x Glossy Paper A4 (also XL) **£25**
- 630Z 50 x Cut Sheet Paper A4 **£12**
- 630P Paintjet 200 Z-Fold paper 8.5 x 11 **£15**
- 630Q Paintjet/XL 50 Transparencies 8.5 x 11 **£32**
- 630S Paintjet/XL 50 Transparencies A4 **£32**
- 630Y Paintjet/XL 200 Cut Sheets 8.5 x 11 **£14**
- 631Y Paintjet/XL 200 Cut Sheets A4 **£POA**

Plug In Font Cartridges for DJ 500

- 22706B – Prestige, Elite, Line Draw fonts **£55**
- 22706C Letter Gothic & HP Line Draw fonts **£56**
- 22707P – Proprint Emulation Cartridge **£57**
- Desk Jet Unlimited (Book No VAT) **£19.75**

Canon Bubblejet Printers

	Printer	CSF	2nd Bin	Ink Cart
BJ10EX	£160	£43	–	£16
BJ200	£275	–	–	£16
BJ300*	£335	£88	£65	£12
BJ330*	£373	£110	£79	£12
BJC800C	£1355	–	–	£16

* Includes 12 months On-site warranty

- Spare Battery pack for BJ10E **£33**
- BJ10EX – Archi Turbo Driver **£42**

Special Offer:
Canon BJ10EX Printer + CC's Turbo Driver **£199**

Epson Printers

FX870	£253	LQ1170	£432
FX1070	£327	LQ2550+	£673
FX1170	£327	LX100	£117
LQ100	£146	LX400	£93
LQ570	£197	LX850+	£134
LQ870	£357	LX1050	£203
LQ1060 Colour	£547	SQ870	£409
LQ1070	£308	SQ1170	£560

- Original Ribbon for LQ100 **£6**

Cut Sheet Feeders for

LQ570, LQ870 **£47**
LX400/850/LQ200/400/450/500/550
LQ1010/1070/1170 **£72**
LX1050 **£115** FX850/LQ860 **£128**
FX1050/LQ1060/SQ850 **£155**
LQ2550 **£299** SQ2550 **£210**

Tractor Feed for

LQ100 **£29;** LQ800 **£44;** LQ850/FX850 **£69;** LQ1050/FX1050 **£85;** LQ2500 **£90;** LQ2550 **£90.**

Accessories

- EX800/1000 Colour Option **£45**
- EX800/1000 Colour Ribbon **£14**
- LQ2500 Colour Option **£65**
- Multifont Card for LQ550/850/1050 **£95**

Epson Printer Interfaces

RS232 **£28** RS232 + 2K Buffer **£52**

Roland Plotters

- DXY1100 **£469**
- DXY1200 **£607**
- DXY1300 **£823**
- DXY2500 **£2345**
- Sketchmate A3 **£499**
- Sketchmate A4 **£308**
- Roland plotter Pens, Fibre tip **£7.50**

Fujitsu Printers

Special Introductory Offer

- B-100 InkJet – HP Deskjet compatible 300dpi, whisper-quiet & 6 resident fonts **#£159**
- B-200 InkJet – HP Desk Jet compatible 300dpi. Built in Cut Sheet Feeder. Optional 2nd Bin/Tractor available **#£249**
- DL-1150 Dot Matrix – 24 pin, 110 column Colour optional **£199**
- DL-1150C Dot Matrix – 24 pin, 110 column With colour option **£235**

FREE 1 Year On-site maintenance.

- B-100 Cut Sheet Feeder **£59**
- B-200 2nd Bin Sheet Feeder **£89**
- B-200 Tractor Unit **£59**
- B-100/200 Ink Cartridges **£14**
- DL-1100 Colour Upgrade **£39**
- DL-1100 Black Ribbon **£5**
- DL-1100 Colour Ribbon **£11**
- VM 800 Toner Cartridge (8000 pgs) **£99**
- DL1200 **£309**
- DL3600 **£439**
- DL4600C **£799**
- DL5600C **£1049**
- DL5800 **£1048**

Full range of Fujitsu Printers available at very competitive prices. Please telephone for details

Listing Paper (Perforated)

- 1,000 Sheets 9.5" x 11" Fanfold Paper **£7**
- 2,000 Sheets 9.5" x 11" Fanfold Paper **£11**
- 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold **£21**
- 1,000 Sheets 15" x 11" Fanfold Paper **£9**
- 2,000 Sheets 15" x 11" Fanfold Paper **£16**
- 1,000 Sheets true A4 Fanfold Paper 70gms **£11**
- 2,000 Sheets true A4 Fanfold Paper 70gms **£21**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50, 2K Sheets £3.00

Printer Labels

(On continuous fanfold backing sheet)

1,000 off, 90 x 36mm (Single Row) **£6.00**
1,000 off, 90 x 36mm (Twin Row) **£6.25**
1,000 off, 90 x 49mm (Twin Row) **£7.50**
1,000 off, 102 x 36mm (Twin Row) **£6.75**

Laser Printer Labels on A4 Sheets

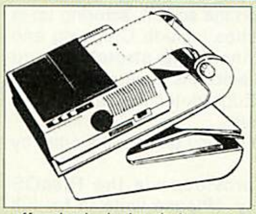
3750 off, 70 x 29mm (3 Rows x 10) **£15.50**
2400 off, 70 x 37mm (3 Rows x 8) **£15.25**

Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
BBC B/BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£3.25	£5.00
DMP2000/4000	£3.75	£4.95
EX800/1000	£3.50	£5.00
RX/FX80/85/800/MX80	£2.95	–
FX/MX/RX100/1000	£3.95	–
Kaga/Taxan KP810/815	£3.25	£5.00
LQ400/500/550/800/850	£3.25	£6.00
LQ1050/LQ2500	£12.00	–
LX400/800/850	£3.50	£5.00
M1009/GLP	£2.95	£3.75
NEC P2200	£4.50	£5.00

Dust covers for most 80 column printers available at £5 each

Professional Printer Stand



The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Its ergonomic design ensures smooth paper flow and automatic refolding.

80 Column version £24 (carr. £3)
132 Column version £29(carr. £4)

Universal Printer Sharers/Changer

Connect up to 5 Micros to 1 printer or 5 printers to 1 Micro with our combined, Sharer/Changer switch boxes.

Standard Low Cost Type

Connects	Serial	Parallel
2 to 1	£10	£10
3 to 1	£14	£15
4 to 1	£19	£20

Professional Type

Connects	Serial	Parallel
2 to 1	£15	£16
3 to 1	£20	£23
4 to 1	£30	£34

Cables extra at £5 each

Cross Over Manual Switch

2 In/2 Out Parallel **£29**
2 In/2 Out Serial **£28**
3 In/2 Out Serial **£36**

Auto Printer Sharer

Connects	Serial	Parallel
2 to 1	£34	£36
4 to 1	£52	£53
8 to 1	–	£85

256k Multi Spooler

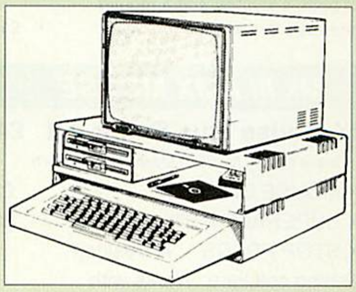
These Auto Parallel Printer Sharers have built-in 256K of Printer Buffers. They can be used as Auto Sharers, Printer Buffers or both.

- 2 In/2 out **£125**
- 4 In/2 out **£139**
- 8 In/1 out **£185**

Compact Converter Units

Serial to Parallel **£32** Parallel to Serial **£32**

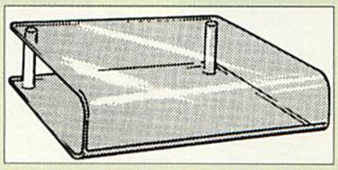
Plinths for the BBC B, BBC Master & A3000



- Single BBC Plinth 420 x 310 x 105mm **£13**
- Double BBC Plinth 420 x 310 x 210mm **£24**
- Single Master Plinth 490 x 310 x 105mm **£14**
- Double Master Plinth 490 x 310 x 210mm **£26**
- A3000 Single Plinth (very sturdy & precision made), has a slot on the left for the switch & cut out on the right for 3.5" Disc Drive **£15**

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 250234 or 233383

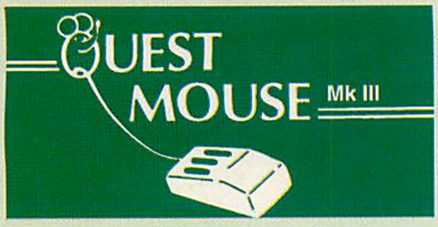
Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

80 Column version £16 (carr £3)
136 Column version £20 (carr £4)

Continued→ → → → → → → → → →



- Quest Mouse III & Quest Paint £49
- Quest Mouse III, Quest Paint, AMX Stop Press & Pagefont £69
- Quest Mouse III only £25
- Quest Paint Software only £28
- Quest Font Disc (22 Text Fonts) £15
- Quest Mouse Mat (Red or Blue or Green please specify) £3
- Conquest (Quest Paint Extension) ROM £24
- Quest Colour Dump Disc – This new software allows you to print direct from Quest Paint to your Integrex Colour Printer £18
  (P.S. Quest Paint is not compatible with BBC Compact)

Quest Paint is the winner of the BBC Acorn User 1990 Award for the Best Art/Graphics software

Mouse Cleaning Kit

To obtain trouble free operation and prolong the life of your mouse, the high tech rodent requires regular cleaning. Our deluxe mouse cleaning kit is ideal for the purpose £3

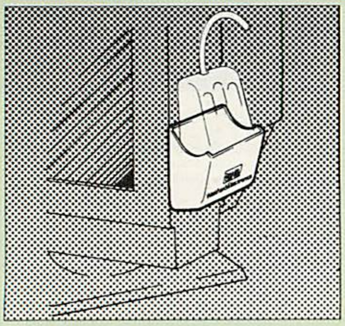
Archi Mouse Port Splitter

Our handy little splitter unit eliminates the risk of damaging your micro due to constant plugging and unplugging of the mouse by allowing you to connect both, a joystick and a mouse simultaneously to your Archimedes. £15

Mk III AMX MOUSE

- **AMX Mouse plus Super Art £49**
  (Please specify for BBC, Master or Compact)
- AMX MOUSE ONLY £25
- AMX SUPERART Package £26
- AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse £25
- PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker £13
- AMX DESIGN (ROM) £29
- AMX EXTRA EXTRA £16
- MOUSE MAT £3

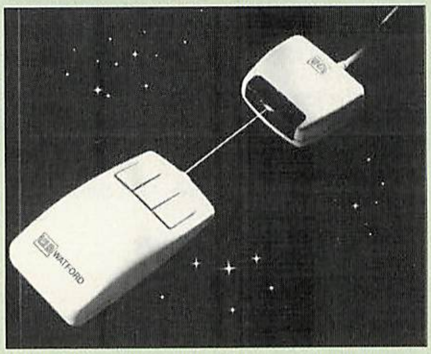
WE Mouse House



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive etc.

Only £3

Archi Cordless Mouse

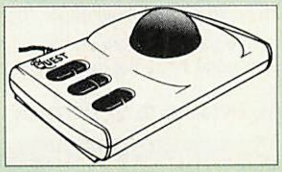


Features
- Infra Red Signal Transmission
- High Resolution 200 DPI
- High Tracking Speed of 600mm/s up
- Anti-static Silicon Rubber Coated Ball
- Low Friction Teflon Footpads
- Power - by two AAA size batteries (not included)
- Automatic Standby Mode after 5 seconds inactive
- Auto Power Shut-Down after 20 seconds inactive

Price £32

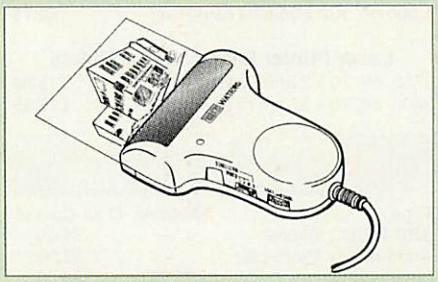
Quest – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version £25
QT-20 Archimedes Version £26

Beeb Hand Scanner



Watford Beeb HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs!

Beeb HandScan & Firmware £99

Archi Mk II Hand Scanner

Watford's Mk II hand scanner has a maximum resolution of 400 dpi. The scanning width is 4". The sophisticated software is supplied in a 64K ROM, located on a standard single width expansion podule. As you scan a page, the image appears in the scanning window on the screen, scrolling up in real time. Other facilities include Cropping and scaling to any size including stretching and squashing in X and Y directions separately. Colour tinting. X and Y flip. Edge detection which turns solid objects into outlines.
Images can be printed on any printer supported by RISC OS.
On-screen help is provided via the RiscOS interactive help facility. (Please write in for full technical details).

AHS-4 Archi 300/400 Version £109
AHS-3 Archi A3000 Version £119



Winner of the BBC Acorn User 1990 Award for the Best DTP/Word Processor

The Wapping Editor

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Wapping Editor Software Pack £49
Wapping Editor plus Mouse £69
(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc.
Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out. **£15**

Wapping Font Disc 1

Sixteen additional fonts, including smaller version of Oberon and Daisy and two new sizes of the standard font for the Wapping editor.
Also included are two Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.
Supplied complete with instructions. **£12**

Wapping Font Disc 2

This new addition to our Wapping range of DTP software provides you with additional 23 fonts for the Wapping Editor DTP pack. (80 track discs only). **£13**

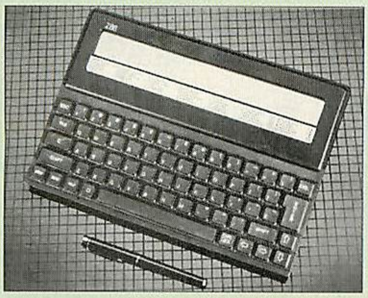
Archi A4 Scanner



The 216mm scanning width can cope with both desktop scanning of single sheets, photographs, diagrams, etc., with its fast ten page automatic document feeder, but it can also detach from the feeder to become a convenient hand-held full page scanner for larger documents or pictures.
Scanned image control can be freely adjusted in increments of 10 dots per inch from 100 up to 400 dpi resolution with 64 levels of grey scaling. A built in shading controller and manual brightness control achieve optimum image clarity.
Unlike some scanners, which use a red light source, the Watford scanner uses a yellow/green source which vastly improves the light/dark contrast, thus eliminating the effect where any red-based colours are faded down to white and so do not show up in the scanned image.

Archi A4 Scanner	£269
Sheet Feeder for above	£75
Scanner + Sheet Feeder	£359

Z88 Portable Micro



- Z88 Portable Micro £169
- 32K RAM Pack or 32K EPROM Pack £16
- 128K RAM Pack or 128K EPROM Pack £32
- 512K RAM Pack £86
- 256K Eprom Pack £55
- Z88 Eprom Eraser Unit £38
- Z88 Carrying Case £8
- AA Nicad Rechargeable Battery £1.50
- Battery Charger Compact & Fast £6
- Z88 Serial Printer Cable £8
- Z88 Parallel Printer Cable £18
- Z88 to Archi Link £15
- Z88 to BBC Link £8 • Z BASE £56
- Z88 to PC Link II £27 • Z88 to Macintosh £32
- Z88 Mains Adaptor £9 • Z88 Modem £114

Psion Series III



Psion, pioneer of the handheld computer, have once again redefined the state-of-the-art with the Series III. Although only pocket sized, this powerful programmable computer has many features found in desk top machines, plus powerful built-in software. They include a full specification wordprocessor and an outliner that is compatible with Microsoft Word, an extensive database, intelligent time and personal management and a powerful multifunction calculator. And with an interchangeable memory of up to 4Mb, you'll never be short of data storage space.

Psion Series III Computer
- Series 3 128K £139 • Series 3 256K £179

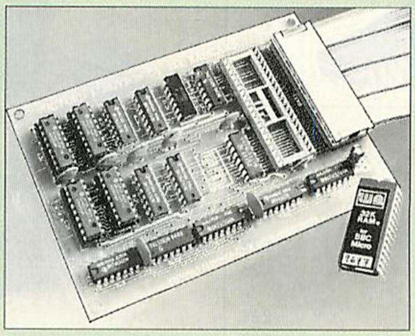
RAM Solid State Discs (SSD)
- 128K £68 • 512K £170 • 1Mb £255

Flash Solid State Disc (SSD)
- 128K £34 • 256K £59 • 512K £102
- 1Mb £170 • 2Mb £255

Communications
- Parallel Interface Link £25
- RS 232 Serial Link for PC £58; Mac £59

Various
- Mains Adaptor 9V AC £12
- Spreadsheet £59
- Professional Finance £42
- Spelling Checker/Thesaurus £42

32K Shadow RAM/Printer Buffer Card Expansion Board



A MUST FOR WORD PROCESSING

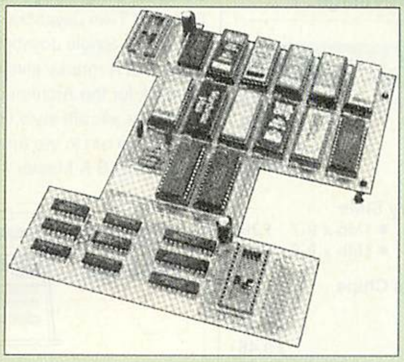
Simply plug the ribbon cable plug into the 6502 socket and gain a massive 32K of extra RAM.

- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28K bytes free – 5 times as much as normal.

- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.

Only £49

Solderless Sideways ROM Socket Board



- Increases your BBC Micro's ROM capacity from 4 to 16.
- **No soldering required.**
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish" allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32

Battery Backup fitted **£35**

Battery Backup only **£3**

16K Sideways RAM **£8**

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

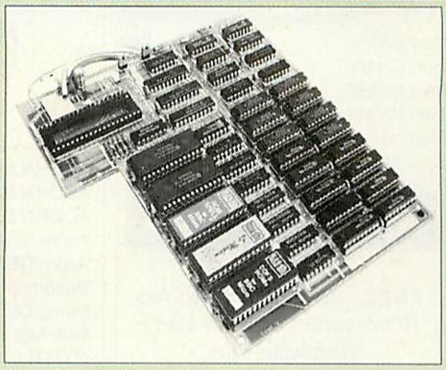
Watford DATA DUCK

Convert two single Disc Drives into one Dual Drive with this simple external unit (Suitable for Disc Drives with PSU. For Disc Drives without PSU, you will also require Watford Power Duck, see below).

£14

Watford POWER DUCK £8

ROM/RAM Card



- No Soldering required to fit the board.
- Compatible with BBC B
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).

PRICES:
- ROM/RAM card with 32k DRAM £39
- ROM/RAM card with 64k DRAM £52
- ROM/RAM card with 128k DRAM £83

OPTIONAL EXTRAS:
- 16k plug-in Static RAM kit £8
- 16k DRAM for Upgrade £13
- Battery backup £3
- Read and Write protect switches £2 each

Complete ROM-RAM card with all options fitted £99

ROM Cartridges for the BBC Master

Will accept the larger Piggy Back ROMs like Interword, Quest, etc.

• Twin **£8**; • Quad **£13**

Disc Drive Power Leads

Supply from BBC power supply to standard Disc Drive Connection: Single **£3.00;** Dual **£3.75**

Disc Drive Interface Leads

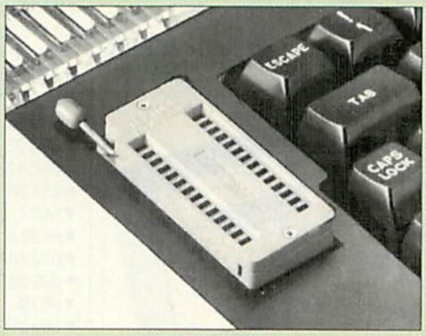
BBC to Disc Drives Ribbon Cable

Single **£4** Twin **£6**

Miscellaneous Connectors

	Plugs	Sockets
RGB (6 PIN DIN)	50p	75p
RS423 (5 pin Domino)	70p	80p
Cassette (7 pin DIN)	40p	95p
ECONET (5 pin DIN)	35p	50p
Paddles (15 pin 'D')	150p	250p
Disc Drive Plug 4 way	100p	–
6 way Power Connector	120p	150p

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without having to open the lid. The ZIF socket is located into the ROM Cartridge's position. It is very simple to install. No soldering required. Also included in the price is a plastic see through storage case with antistatic lining, which allows you to store 12 ROMs.

£18

Computer Concept's ROMS

Inter BASE	£49
Inter CHART	£25
Inter SHEET	£37
Inter WORD	£36
Mega-3 ROM	£76
Spell Master	£42

Wordwise plus

£38

FREE, the superb Word-Aid ROM worth £24, with every Wordwise Plus.

Word-Aid

This advance utilities ROM extends the power of your Wordwise plus ROM.

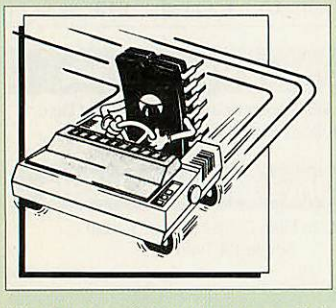
Only **£24**

(N.B. Word Aid requires a Disc interface in your Micro)

Acorn ROMS

View 3.0 ROM	£45
Viewsheet (Acornsoft)	£36
Viewstore	£36
Viewspell – 80T disc	£25
View-Index	£12

View Printer Driver ROM



View is a powerful word processor, but it seriously lacks in terms of printer driver support. With the View Printer Driver ROM, the View users will find themselves in the realms of advanced word processing.

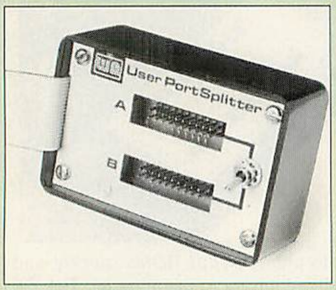
Price: Only £29

Mini Office 2 – Disc

for BBC B & B+ £12

(When ordering please specify for which Micro & 40 or 80T Disc)

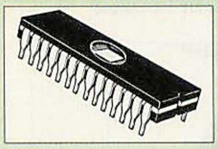
User Port Splitter Unit



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows you to connect two devices simultaneously to the BBC's user port.

Excellent Value at **£22**

Assorted ROMS



ACORN ADFS	£25
ACORN BASIC 2 plus User Guide	£22
ACORN DNFS	£17
Acorn OS B+	£25
Acorn OS 1.2	£14
Beebmon	£22
Dump Out 3	£25
Graphics Extension Rom	
GXR-B	£21
GXR-B+	£22
Logotron LOGO	£43
MASTER OS ROM	£38
Master ULA (47)	£15
Master ULA (60)	£10
Numerator – Archi	£69
Numerator – BBC	£39
Pendown ROM	£32
Rom Manager	£20
SERIAL ULA	£13
TED	£35
Video ULA	£14
1Mb OS ROM	£39

Watford Electronics' New High Tech Computer Boutique is now open in Luton. Don't miss your chance to visit the Acorn Village.

CHIP SHOP

1 MB-10 DIL D-RAM	£4.50
1 MB ZIF D-RAM	£4.00
256K x 4-8 DIP	£4.75
256K x 4-8 ZIF	£4.00

Memory SIMs

- 256K x 9-7 £9 • 1Mb x 9-7 £29
- 256K x 9-8 £9 • 1Mb x 9-8 £33

Various Chips

DS3691	£4.50
DS88LS120	£5.25
LM324	£0.45
SN76489	£5.50
SAA5050	£8.75
UPD7002	£6.00
2764-250nS	£3.00
27128A-250n (12V5)	£2.50
27128-250nS (21V)	£4.00
27256-2	£3.00
27512-2	£4.50
27C101G (1 Meg)	£7.00

• 4013	75p	• 68B50	£2.95
• 4020	£1.00	• 7438	50p
• 4164-10	£1.55	• 74LS00	50p
• 4464-10	£3.50	• 74LS04	50p
• 4816 RAM	£2.00	• 74LS10	50p
• 41256-8	£2.00	• 74LS123	£1.00
• 41256-10	£1.50	• 74LS163	£1.00
• 6264LP-8K	£4.00	• 74LS244	£1.00
• 6502A	£5.00	• 74LS245	£1.00
• 65C02 3M	£9.75	• 74ALS245	£2.75
• 65C12	£9.00	• 74LS373	£1.00
• 6512A	£10.00	• 74LS393	£1.00
• 6522	£4.00	• 75453	£1.00
• 6522A	£5.00	• 75159	£3.00
• 62256ALS	£10	• 8271	£32
• 62256P-12	£8.50	• 9637	£2.00
• 6818	£4.00	• ICL7673PA	£3.00
• 6845SP	£6.00		

Acorn Speech Synthesizer package complete, for the BBC B Microcomputer

Special Offer £14

Commander Joystick



Features:

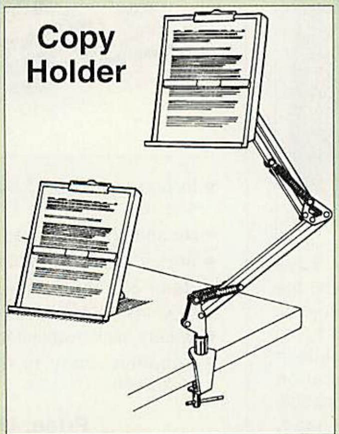
- Direct connection to BBC Analogue input port – interface needed.
- Fully compatible with all BBC Joystick controlled games programmes.
- Switchable springs allow selection of floating or centring operation.
- Trim adjusters for both X and Y axes for fine centre adjustment.
- Convenient stick mounted fire button with additional base buttons.

Price: £15

Voltmace Joysticks

Delta 3B Single Joystick	£10
Delta 3B Twin Joysticks	£15
Delta 14B Single Joystick	£11
Delta-Cat A mouse eliminator Joystick for the Archimedes	£24
Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128	£25

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly be means of a plastic retaining ruler and a clip grip.

Desk Top **£8**

Angle poise **£12**

NEW Copy holders as above but with a battery operated, remote controlled cursor/ruler. (By hand or foot pedal.) (Batteries 2 x AA not included.)

Desk Top **£15**

Angle poise **£20**

Adder EPROM Programmer

Adder EPROM Programs 2764 and 27128 EPROMs for the BBC and BBC Master. Connects to the User port.

Offer Price: **£39**

TEX EPROM ERASERS

Over erasure of EPROMs very rapidly turns them into ROMs!
The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast.

- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. £36
- Spare UV tubes. £12

ROM Extraction Tool

This extremely useful tool allows you trouble free chip insertion and removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip.

- Plastic Chip Extractor **£2**
- Metal Chip Extractor **£3**

Servisol Foam Cleaner

This king size multipurpose foam cleaner spray is ideal for cleaning Keyboard, Monitor, Disc Drive & Computer furniture surfaces.

£2.50

Antistatic Aerosol Spray

Ideal for cleaning and preventing static build-up on TV/Monitor Screens.

£2.50

Aerosol Dust Spray

Ideal for removing dust & dirt from Keyboard & similar inaccessible spaces. **£3**

OFFICE MASTER

• CASHBOOK • FINAL ACCOUNTS • MAILIST • EASILEDGER – • INVOICES & STATEMENT

All this for only **£21** (Disc)

OFFICE MATE

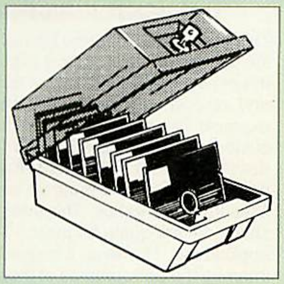
• DATABASE • SPREADSHEET • BEEBPLOT

Only £10 (Disc)

Spares for BBC Micro

UHF Modulator	£4
Speaker £3; Speaker Grill	£1
Keyswitches	£1
16MHz Crystal	£2
17.734 MHz Crystal	£2
32.768MHz Crystal	£2
Replacement 17 way Flexible Keyboard Connector	£4
BBC Master Power Supply	£59
BBC Master Keyboard	£62
BBC Master Casing	£49
Refurbished BBC B Spares	
BBC B Casing	£19
Clear Perspex Keystrip Holder	£3
BBC B Keyboard	£35
BBC B Power Supply	£42

Antistatic Lockable Disc Storage Units



- **M35** – holds up to 50 5.25" discs £4.95
- **M85** – holds up to 95 5.25" discs £6.95
- **M25*** – holds up to 25 3.5" discs £4.95
- **M50** – holds 50 3.5" discs £6.50
- **M100** – holds 100 3.5" discs £6.99
- **M10** – holds 8 of No. 10 Data Cartridges £15

* Not lockable

Disc Plonker Rack



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk. Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: **£2**

3M – Diskettes

Lifetime warranty on 3M Discs

- *10 x 5.25" S/S D/D 40T (744)* *£5*
- *10 x 5.25" D/S D/D 40T (745)* *£5*
- *10 x 5.25" S/S D/D 80 Track (746)* *£6*
- *10 x 5.25" D/S D/D 80 Track (747)* *£7*
- *10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT* *£8*
- *10 x 3.5" S/S D/D 40/80 Track* *£6*
- *10 x 3.5" D/S D/D 40/80 Track* *£6*
- *10 x 3.5" Double Sided High Density* *£10*

Top Quality Diskettes

Watford's life time guaranteed disc are supplied complete with self stick labels & plastic library case.

- *10 x **M3** 3.5" D/S D/D 80 Track* *£6*
- *10 x **M9** 3.5" D/S High Density* *£10*
- *10 x **M4** 5.25" S/S D/D 40 Track* *£5*
- *10 x **M5** 5.25" D/S D/D 40 Track* *£5*
- *10 x **M7** 5.25" D/S D/D 80 Track* *£6*
- *10 x **M8** 5.25" D/S H/D Hi-Density* *£9*
- ***M2** 3" Double Sided* *£2.50 each*

Special Bulk Offer Discs

(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S/S 40T	D/S 40T	D/S 80T
Without Sleeves 5.25"	£25	£30	£35
With Sleeves 5.25"	£28	£33	£38
3.5" D/S D/D	£21 for 50	£39 for 100	
3.5" D/S H/D	£40 for 50	£75 for 100	

3.5" Disc Drive

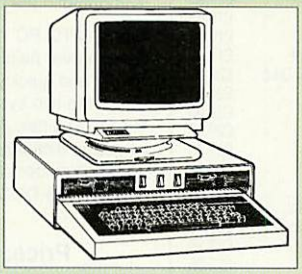


These top quality 3.5" Double sided, 80 track, are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Type	Description	
	Disc Drive without PSU	
CLS35:	Single Disc Drive, 400K	£59
CLD35:	Twin Disc Drives, 800K	£109
	Disc Drive with PSU	
CS35:	Single Disc Drive, 400K	£82
CD35:	Twin Disc Drives, 800K	£126

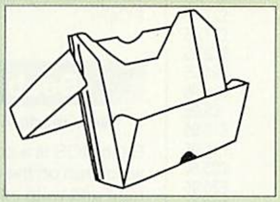
(P.S. CS35 is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage)

Disc Drives in Monitor Stand



- **CDPM 800S** – Twin 5.25", 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC B & Master 128K micros. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use. **£165**
- **DP35 800** – Same as above except, one disc drive is a 5.25" and the other is 3.5". **£154**

Plastic Library Cases



- **DLC1** – Holds 5 x 3.5" Discs. £1.50
- **DLC2** – Holds 10 x 3.5" Discs. £1.90
- **DLC3** – Holds 5 x 5.25" Discs. £1.60
- **DLC4** – Holds 10 x 5.25" Discs. £2.00

Disc Albums

Attractively finished in leather-look PVC Vinyl

- **DW1** – Holds 6 x 3.5" Discs £2.50
- **DW2** – Holds 6 x 5.25" Discs £3.00
- **DW3** – Holds 20 x 5.25" Discs £3.50
- **DW4** – Holds 40 x 3.5" Discs or 5.25" Discs £4.50

Floppy Head Cleaner Kit

The heads in floppy drives are precision made and very sensitive to dirt. The use of Cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. it is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

Acorn & Watford DFSs

- Watford sophisticated DFS ROM £16.00
- Watford DFS Kit complete £49.00
- DFS Manual (comprehensive) £6.95
- Acorn DNFS ROM £17.00
- Acorn ADFS ROM only £25.00
- Acorn 1772 DFS ROM Kit £49.00
- Acorn DFS Kit complete £48

Watford's MkII 1772

Single/Double Density DFS

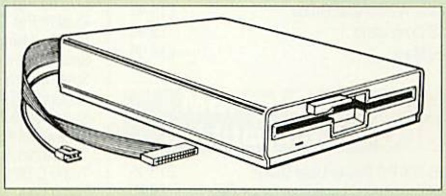
Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1772 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1772 DFS, plus many more added features.

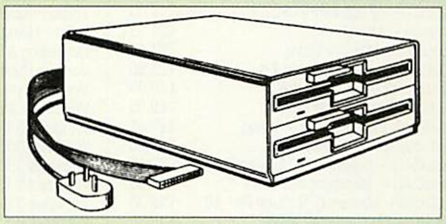
- Complete Kit — Special Price **£44**
- DDFS Manual — (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£26**

Quality Disc Drives from Watford

All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. All 5.25" Disc Drives are 40/80 track switchable. For ease of use, the switches are front mounted. Follow the trend with a Watford plinth. *(Turn to the 6th page of our advert for the Plinths).*
P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is our special Compact Disc Drive cables designed by us.

"Test Bureau Approved for Use in Education"





Our Disc Drives conform to BS415

Type	Description	
	Disc Drive without PSU	
CLS400S:	Single, 40/80 track 400K Double sided Drive	£70
CLD800S:	Twin, 40/80 track, 800K Double sided Drives	£138
	Disc Drive with PSU	
CS400S:	Single, 40/80 track, 400K Double sided Drive	£80
CD800S:	Twin, 40/80 track, 800K Double sided Drives	£149

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View Store (BMC) ROM	30.00
Vistfax-Viewdata (B) ROM	20.00
Vocab Tester (B) Tape	8.00
Vu-Calc (Psion) (B) Tape	8.00
VU-File (B) Tape	10.00
VU-Type (B) Tape	6.00
Welcome FORTH (B) ROM HCCS	18.00
Wordease (B) ROMs	12.00
Wordwise Plus (BM) ROM	25.00
ZOOM Mach. Code Monitor (B)	10.00

GAMES

Apocalypse (A) Disc	10.00
Barbarian II (BM) Disc	6.00
Boxing Manager (A) Disc	12.00
Conqueror (A) Disc	14.00
Corruption (A) Disc	15.00
Dominate (A) Disc	10.00
Dronga (B) Disc	5.00
E Type (A) Disc	8.00
Enter the Realm (A) Disc	12.00
Fine Racer (A) Disc	12.00
Firebug (B) Disc	5.00
Fish (A) Disc	15.00
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Hoverbod (A) Disc	8.00
Indoor Sports (B) Disc	6.00
Interdictor (A) Disc	13.00
Interdictor 2 (A) Disc	20.00
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Quazar (A) Disc	6.00
Real McCoy (A) Disc	18.00
Real McCoy 2 (A) Disc	15.00
Ricochet (BM) Disc	6.00
Saloon Cars (A) Disc	12.00
Sam 4 (C) Disc	7.00
Spheres of Chaos (A)	15.00
Spycat (BM) Disc	6.00
Terramex (A) Disc	12.00
The Sentinel (B) Disc	6.00
Trivial Pursuit (B) Disc	6.00
U.I.M. (A) Disc	13.00

BBC B & MASTER 128 USERS WE HAVE NOT FORGOTTEN YOU !



FREE ADS

● BBC Master 128, colour monitor, disc drive, monitor stand, twin joysticks, Art package, software, excellent condition – £500. Contact Mr N Buckley, Kings Lynn. Tel: (0553) 673027

● BBC B+ 64k, 1770 DFS, Viglen 40/80 disc drive, twin Voltmace joysticks, Wordwise Plus, software on 5.25in discs. Contact M Walker, Didcot. Tel: (0235) 813557

● I/0 Expansion card AKA10 – £50 ono, Poster – £40, Chameleon 2 – £20, Midnight Graphics Tracer – £20, Cartoon line – £10, CCs extra borders disc – £5. Contact Mr J Bancroft, Northants. Tel: (0933) 317562

● Archimedes two 48Mb external SCSI hard discs – £160 each, SCSI interface – £75, A3000 podule case – £9, 3.5in/5.25in external drive interface – £15, games – £10. Contact R Homer, Gwynedd. Tel: (0407) 810091

● BBC B games discs – £3-5, tapes – £1-2, Micro User 1985-89, Acorn User 1987-91 – free. Contact Mr S Hennigan, Kent. Tel: (0634) 201470 after 6.30pm

● 2Mb A310M, colour monitor, 20Mb hard drive, Impression, Pipedream, Pro Artsian, Elite, Lemmings, Elite, Saloon Cars and many others – £700. Contact Mr J Quigley, Worthing. Tel: (0903) 204463

● Scanlight Junior plus Computer Concepts scanner – £95, Vision B/W digitiser external – £39, Deltacat joystick – £15. Contact Mr T Dagger, Blackpool. Tel: (0772) 265421

● Wanted: User interface Plus 1 for Acorn Electron with data for use. Contact T Jones, Cumbria. Tel: (09467) 28938

● Archimedes A310 and stereo monitor, Panasonic Dot Matrix printer, all boxed as new, loads and loads of software – £570 ono. Contact Mr R Bielby, Southport. Tel: (0704) 24615

● BBC Master, disc drive, monitor, printer, mouse, Amx Art, Pagemaker, Spellcheck, Music 5000 synthesiser and 4000 keyboard – £400 ono. Contact D Candish, Salisbury. Tel: (0722) 322977

● Joystick interface (Leading Edge A5000 compatible) Plus 2, Superpro, unused – £45 (cost £62). Contact A Jeffery. Tel: (0278) 751 317

● BBC B, 40/80 disc drive, DFS, cassette, Cub colour monitor (slight fault), some books – £180. Contact Mr M Milton, Bromley. Tel: 081-467 5427

● Wanted: A disc copy of Tetris for BBC B. Contact Mr B Ferris, London SE4. Tel: 071-252 9044

● Acorn Cambridge workstation – offers. Buyer collects. Contact Mr D Igles, Lancaster. Tel: (0524) 65201 x2325

● Electron 32K, Plus 1, 5.25in disc drive interface, tape recorder, View, Viewsheet, Rom database, games, all books – offers. Contact Mr A Summerscales, York. Tel: (0347) 22084

● Master 128k 65C102 co-processor, Microvitec medium resolution monitor, twin TEAC disc drives, Roms, manuals, programs – £325. Contact M Robertson. Tel: (0296) 23124

● Master 128, single 40/80 disc drive and assorted original games – £250, Amstrad DMP 3000 – £75. Contact M Price, Rutland. Tel: (0664) 79629

● Wanted: 3.5in disc drive for a Master Compact. Contact Mr E Smith, Newcastle-Under-Lyme. Tel: (0782) 615673

● A3000, 2Mb, 40Mb hard drive (Watford IDE external interface with power supply unit), loads of software, Acorn registered, free discs, can arrange delivery – £550 ono. Contact H Rogers, Dorset. Tel: (0935) 817085

● A3000 colour, 2Mb, 72Mb Scsi hard drive, colour digitiser, sound sampler, Rom podule, 13510c with colour upgrade, Risc OS 3.1, 5.25in drive etc – £1500. Contact Mr C Holland, Dorset. Tel: (0202) 622123

● Electron accessories, Acorn Plus 1, joysticks etc – £25, Plus 3 3.5in disc drive – £40, books – £10, 70+ games – £50, all – £110. Contact Mr T Smith, Essex. Tel: (0376) 329687

● 3.5in floppy disc drive, cased with built in power supply, suit Archimedes, BBC or IBM – £40 ono. Contact Mr R Mann, Telford. Tel: (0952) 613062

● A3000, 4Mb memory, Philips colour monitor, stand, Deltacat joystick, splitter box, much software, all boxed as new – £700 ono. Contact Mr P Taylor, Bradford. Tel: 90274) 674536

● A3000, Acorn colour monitor, stand, 5.25in interface and drive, joystick, manuals, application discs, Artisan, games, boxed, excellent condition – £700. Contact Mr M Jakeman, Coventry. Tel: (0203) 311382

● Master 512k, 280 processor, Taxan colour monitor, Cumana 40/80 double disc drive, Epson FX80 printer, manuals, discs, Overview, Wordwise, Gem, games, excellent condition – £400. Contact N Penty, Woking. Tel: (0483) 764904

● A3000, 2Mb with Midi interface, mouse, manual, software, bargain – £395. Contact Ms G Brown, Essex. Tel: (0836) 556665

● Master Compact with second disc drive and Pal TV adaptor, Dump Out 3 Rom fitted – £300. Contact W Candlish, Dumfrieshire. Tel: (0461) 40648

● A310 Watford Electronics 2Mb Ram upgrade (plug in) – £75. Contact Mr M Glass, Huntingdon. Tel: (0480) 434184

● Watford Electronics four podule backplane for A310 – £10, never been used, Corruption – £12, Overload – £12, A3000, printer – offers. Contact Mr M Humphreys, Staffordshire. Tel: (0782) 542973

● Archimedes 310, 4Mb Ram, 20mb drive, 5.25in interface must sell– £950 ono. Contact P McLoughlin, Tyneside. Tel: 091-487 6061 after 5pm

● A3000, 2Mb Ram and colour monitor, original application discs, good condition – £400. Contact Mr T Napier, Harrow. Tel: 081-861 4623

● BAU: Jan 83- Dec 90 nos 2-101 (63,67 missing) – £10, Beebug: Apr 82-Apr 90 vols 2-8 (vol 7#1 missing) – £10, collect or carriage extra. Contact L Jones, Bedford. Tel: (0234) 781798

● BBC B, two 40/80 track disc drives, 6502 second processor, colour monitor, Panasonic printer, HCR Rom box, Roms and manuals, games including second processor Elite – £350 ono. Contact Mr A Wilkinson, Cheshire. Tel: (0625) 874764

● Wanted: User manual for Centronics printer model 150-4, your price please. Contact Mr J Roberts, Stoke on Trent. Tel: (0782) 324407

● Integrex colour printer, Inset full colour with two spare cartridges, superb results on the Archimdes. Contact Mr L Mackay. Tel: 031-447 3770

● Complete Midi music system: BBC B, Midi interface, sync unit, 16 track sequencer/score writer Roms, sideways Rom/Ram, disc drive, Wordwise Plus, fully documented – £240, Panasonic printer – £75. Contact Mr C Thompson, Kent. Tel: 081-302 5849

● Master 128k, colour monitor, 5.25in and 3.5in disc drives, Music 500, micronet Rom, Prism modem, manuals, joysticks, games – £400. Contact Mr J Ponder, Bucks. Tel: (0494 673222

● A3000 colour 2Mb, extra drive, Learning Curve, 25 discs software, DeskEdit, Arcscan utilities etc, all manuals, mags, as new, delivery considered – £650. Contact Stott, Pretson. Tel: (0772) 784821

● Oak SCSI interface – £65, EMR Midi interface – £65, Microstudio – £30, 5.25in disc drive 40/80 track – £25, Gods – £10, Dropship and Powerband – £7 each. Contact Mr T Goodley, Lincs. Tel: (0775) 761161 or 0775 710640 eve

● Master 512 BBC/PC, duel 40/80 disc drives, Cub monitor, mouse, light pen, manuals, user tech, software BBC and PC, many extras, Roms, cartridges, joysticks etc – £550 ono. Contact Mr T Wildman, Birmingham. Tel: 021-748 2352

● Wanted: Software, Risc Basic, Hard Disc Companion 2 and Schema. Contact Mr K Faulkner, Co Down. Tel: (0247) 874597 weekends.

● Master 128K, Opus 40/80 dual drive, Amber monitor, Viewstore Rom, View printer driver generator, little used, manuals – £325. Contact Mr N Holden, Middlesex. Tel: (0932) 781637

● Archimedes 440/1, 4Mb Ram, 50Mb hard drive, Risc OS 3.1, colour multisync monitor, over £250 software including Flexifice and more, loads of PD – £1200 ono. Contact Mr R Walker, Kent. Tel: (0227) 792737

● A3000, colour monitor, PC Emulator, stand, original, boxes and manuals – £490. Contact D Bell, Eastbourne. Tel: (0323) 735841

● Wanted: Thornton Compass 2D Rom and discs (drawing package) for BBC B and also compass starter discs. Contact E Dinning, Newcastle.Tel: (0207) 70122

● Master 128K Cumana 40/80 twin disc drive, Acorn colour monitor, Juki 6100 printer, Wordwise Plus, Rom cartridge, software games/serious (x50discs). Contact Mr E Wallace, Barnsley. Tel: (0226) 370147

● Four processor system: Master 512, external switched 6502/4Mb Arm coprocessors, dual double sided 80 track disc drives, manuals etc – offers, will split. Contact Mr D Dearlove, Surrey. Tel: (0932) 243064

● Master 512, dual 40/80 disc drives, Gem, mouse, Rom cartridges, PC Emulator, Interword, boxed Overview set, many Roms, some games, reference books, discs and disc box – £200. Contact W Critchley, Northants. Tel: (0933) 678053

● A3000, Risc OS 3.1, 4Mb, dual external disc drive, colour monitor, joystick, manuals, games and serious software – £700 ovno. Tel: (0793) 782540

● Watford A3000 I/0 card – User/analogue/iic – £35, Watford 50Mb IDE hard drive (internal)– £150. Contact Mr V Robertson, Westhill. Tel: (0224) 743733

● Master 128, colour monitor, double double disc drive with power supply, Viewstore and master Rom, extras – £350. Contact Mr A Ross,Nottingham. Tel: (0602) 654002

● A5000 4Mb Ram, 100Mb hard drive, Panasonic C1381 monitor – £1395, HP Deskjet 500 – £250, all in immaculate condition, boxed, manuals etc. Contact Mr N Gleeson, Stoke. Tel: (0782) 771914

● Wanted: Risc OS programmers reference manuals complete – must be cheap. Contact Mr T Markettos, Hants. Tel: (0428) 723387

● Data Logger, (intelligent) by RS Components, hooks to computer, scope printer, absolutely as new, cost – £550, good offer secures. Contact Mr B Watson, Hamilton. Tel: (0698) 283582

● Wanted: Archimedes contacts from all over the world to swap PD, 100% reply. Contact Mr R Barkhuysen, Elderenweg 11, 3770 Riemst-Millen, Belgium.

● Master 128, 65C102 co-processor, Philips mono monitor, twin 800k disc drives in Watford CDPM 800S plinth, teletext – £400. Contact D Evans, Boston. Tel: (0205) 360400

● Wow 1 Artworks, boxed with manuals and Dongle Dangler, brand new only £130 ono. Contact Mr M Woodruff, Gwent. Tel: (0633) 253670

● A3000 disc drive interface and DFS reader, Beebug, used once, eight months old, excellent condition – £22. Contact Mr R Baker, Chelmsford. Tel: (0245) 256416

● Master Compact colour system, Amx mouse and Superart, PMS Publisher with fonts, various games, manuals, original packaging – £299. Contact Mr A Priest, Nottingham. Tel: (0602) 269305

● BBC B, 32k Shadow Ram, twin Viglen 40/80 disc drives, Interword sheet-chart-base, green 12in monitor, games – £245. Contact Mr R Young, Harrow. Tel: 081-427 4039

● BBC B to PC, Torch Graduate, 640k 10Mb hard drive controller, twin floppy, software, manuals, ast six pack – £200 ono. Contact Mr R Burley, Gillingham. Tel: (0634) 377115

● A3000, 2Mb Ram, Acorn colour monitor with pres stand, mouse, manuals, software. excellent condition – £600. Contact Mr M Corner, Hereford. Tel: (0981) 550450

● 8 pin Dot Matrix printer, Epson compatible, good condition – £30, printer sharer 2x1 and Centronics lead – £30. Contact Mr G Carr, London N10. Tel: 081-883 8535

● Archimedes 410/1, upgraded to 4Mb Ram, 20Mb hard disc, Risc OS 3, second floppy interface, lots of software, immaculate – £780. Contact Mr R Bryder, Stirlingshire. Tel: (0324) 814822

● Panasonic KX-P1081, 9 pin printer – £100, Archimedes games: The Real McCoy – £15, Nevryon, Drop Ship, Speech, Apocalypse – £10 each, Tracker (music) – £30. Contact Mr N Maddock, Uxbridge. Tel: (0895) 231011

● Watford MK11 hand scanner A400 series – £70. Contact Mr M Bodley, Lincoln. Tel: (0522) 720713

● A3000, Philips CM8833 colour monitor, Impression DTP plus various arcade games, Interdictor etc. Contact Mr Campbell, Cornwall. Tel: (0637) 872201 ext 7733

● Flexifile – £40, Acorn DTP – £35, 1st Word Plus (rel 2) – £30, Arcpinball – £10, Pipemania – £8, Elite Gold – £20, Last Ninja – £15, Panasonic KXP1081 printer – £40. Contact Mr G Williams, Essex. Tel: (0277) 625613

● Master 128, single 40/80 drive, colour monitor, Panasonic KX1080 printer, Teletext adaptor, mouse, joystick, Quest Paint – £500 ovno. Contact Mr J Allan, London N29. Tel: 071-263 8823

● Archimedes A310, Acorn colour monitor, lots of software, serious and fun, boxed as new – £550. Contact Mr R Evans, Colchester. Tel: (0206) 872868/865413

● For information about the Archimedes Users club contact Mr J Michalski, 6 Furzeland House, Sheephouse Way, New Malden, Surrey KT3 5PH

● A3000 Learning Curve, dual disc drive, colour stereo monitor, 1st Word Plus, PC Emulator, Genesis, Arcticulate, Hostages, joystick interface, mouse, one year old – £600. Contact Mr A Yardley, Harrogate. Tel: (0423) 562709

● Archimedes A420/2, 40Mb hard disc, 2Mb Ram, Philips colour monitor, mouse, boxed, manuals, software – £750, Canon BJ-10e printer, nearly new – £200. Contact Mr D Sanderson, Derbyshire. Tel: (0457) 865913

● Master 128, colour monitor, twin 40/80 double sided disc drive, Taxan printer, Spellmaster, Viewstore, Amx mouse, Superart etc, other software, manuals – £450. Contact Keeling, Leicester. Tel: (0533) 864665

● BBC B, DFS, disc drive, VDU, view, manuals, games, joystick – £200. Contact Mr C Watts, New Milton. Tel: (0425) 613 684

● BBC B Issue 7, Watford DDFS 1.54T, data recorder, 183 games – £195, Amx Superart, mouse – £35, Wordwise Plus, Wordaid – £25, DSDD 40/80T drive – £40, everything – £270 ono. Contact Mr G Froude, Gwent. Tel: (0633) 265145

● A3000, colour monitor, original manuals and discs also Pace Intelegent Modem and Hearsay communications software, all boxed as new – £650 ono. Contact Mr J Albery, Essex. Tel: (0376) 326305

● Bargain! BBC B, Watford 40/80 disc drive, Ground Control text adaptor and ATS, Wapping Editor, Quest mouse and 150 plus games – £180 ono. Contact Mr J Allum, Ipswich. Tel: (0473) 720844

● Master 128, dual drives, printer with DTP, mouse, Viewspell, Smart Cartridge, ADT, many games, all manuals and much more – £350. Contact Mr G Key, Stockport. Tel: 061-442 5158

● BBC B, 40/80 disc drive, Watford DDFS, colour monitor, over 70 games including Exile, Elite, Wordwise Plus – £250. Contact Mr A Rodgman, Bristol. Tel: (0761) 462810

● BBC Master 128, 40/80 twin disc drive in console, monitor, mouse, software, manuals – £260. Contact Mr M Follows, Derby. Tel: (0332) 824562

● ST506 hard disc controller podule – £40, BBC Roms Forth and Conquest – £15 each. Contact Mr M Smith, Lincs. Tel: (0780) 54029

● BBC B, colour monitor, recorder, twin drives, Watford Rom/Ram board (full), replay, teletext, manuals, books, games, excellent condition, boxed – £325. Contact Mr I Twisleton, Northampton. Tel: (0604) 845257

● MIG 15, Apocalypse, Worldscape – £10 each, Chocks Away plus Chocks away extra mission – £17.50. Contact Mr M Wheatley, Kent. Tel: (05806) 2809

● Wanted BBC B DFS (or DFS upgrade chip). Contact Mr L Spedding, Cumbria. Tel: (0228) 32820

● Star LC 200 colour printer, lead and driver, boxed, little used – £125, also 3.5in Cumana external disc drive for A3000 – £70. Contact Mr A Taylor, Essex. Tel: (0277) 630948

● BBC B DFS, Cumana 40 track and power supply unit 5.25in, Watford CD35 80 track and power supply unit, full Rom/Ram board, Data Duck, Wapping Editor, mouse, discs, Wordwise WordAid – offers, will split. Contact Mr R Brooke, Liverpool. Tel: 051-228 1612

● BBC Master 512k, Ms Dos, 5.25in and 3.5in disc drive, Cub medium resolution monitor, lots of software, books and boxes – £400 ono. Contact Mr R Connett, Plymouth. Tel: (0752) 706872

● Wanted: A3000 hard drive and interface if required, also bubble jet printer (HP500). Contact Mr D Stevenson, Kent. Tel: (0304) 380245

● Master 128 with Roms, Viewsheet, View, Wordwise, Spellmaster, Intersheet, 20Mb hard disc, 40/80 disc drive in monitor stand, user friendly – £295 ono. Contact E Williams, Kent. Tel: (0474) 853534

● Schema, mint condition, surplus to school requirements – £60 ono. Contact Mr P Lawrence, London W5. Tel: 081-566 2971

● BBC B, immaculate condition, sideways Rom board and many Roms, twin 5.25in 80 track drives, Philips mono monitor, other accessories, software, manuals – £200. Contact Mr J Rayfield, Bucks. Tel: (0753) 653466

● Acorn desktop development environment and Ansi C release 4, as new and unregistered – £160. Contact Mr J Evans, Bristol. Tel: (0272) 736237

● BBC B 128k, DFS, 40/80 disc drive, colour RGB monitor, View and View sheet Roms, games, joystick and books – £300. Contact Mr D Stott, Dewsbury. Tel: (0924) 430828

● A3000, Learning Curve pack, colour monitor, disc case, games such as Superpool, Elite, extras, all boxed as new – £450. Contact Mr J Howell, Norfolk. Tel: (0953) 605640

● Hybrid music 5000 synthesiser, new complete and boxed – £70. Contact Mr C Benton, Hamilton. Tel: (0698) 428907

● Watford double sided 3.5in disc drive without power supply unit – £25. Wanted, Winchester hard drive for Master 128. Contact J Lampard, Salisbury. Tel: (0722) 331442

● Master 128, 40/80 twin drives, colour monitor and swivel base, Quest Rom and mouse, some disc software – £375 ono. Contact D Shilladay, Selby. Tel: (0757) 705558

● A310, dual drives, RGB monitor, printer, games, Interdictor and Swiv etc, bargain – £650. Contact Nhan San, London SW4. Tel: 081-674 8895

● BBC Master 128, boxed with 40/80 track double sided disc drive, word processor, Spellchecker, spreadsheet and other utilities, worth over £550, bargain – £250 ono. Contact Mr P Winter, Surrey. Tel: (0372) 452036

● Electron with Slogger 64k, Acorn Plus 3, disc drive and 34 discs of software – £110 including p&p. Contact Mr C Oliphant, Kent. Tel: (0227) 368287

● Archimedes 310 basic model, software includes Graphics Writer, Logistics, Artisan, PC Emulator and games plus programmers reference manual – £350. Contact Mr G Cutting, Herts. Tel: (0923) 856663

● Master 128 with internal second processor, dual 40/80 drives, modem, green screen monitor, View, Viewsheet, Viewstore, Interword, all manuals and many discs and magazines – £350 ono. Contact Mr G Banyard, Harrogate. Tel: (0423) 870978 eve

● Master 512k, 40/80 double drives, colour monitor, mouse and PC Emulator, includes Gem software, manuals and many mags – £395. Contact Mr P Mawer, Surrey. Tel: 081-715 4429

● Quest Paint, mouse, Conquest, complete roms, discs, books – £40, Master Quad cartridge ideal for above – £12. Contact H White, Wirral. Tel: 051- 342 4018

● BBC Master, 40/80 track disc drive, mouse, Quest Paint, Wapping Editor, Super Art, Dumpout 3, games utilities, twin joysticks, Logo, Office Mate Master – £300. Contact Mr G Davison, Coventry. Tel: (0676) 34853

● Scsi interface and 47Mb Worru Winnie (oak) external hard drive for most machines, excellent condition, rrp £550+ – £450. Contact Mr N Piggott, Longsight. Tel: 061-225 5312

● A3000, 2Mb, Acorn colour monitor and stand, NEC P2200 24 pin printer, manuals and software including games etc – £750. Contact Mr B Parkhurst, Leeds. Tel: (0532) 757523

● Due to a huge backlog of free ads, there is no coupon this month. Please do not send in requests for ads until the coupon reappears. Thank you.

COSMIC CONUNDRUMS

Jodrell Bank's Simon Melhuish finds Acorn machines vital to his study of the birth of the universe

A group of American astronomers hit the headlines at Easter last year when they published early results from a radio telescope in orbit about the Earth, called the Cosmic Background Explorer; COBE. The researchers, led by G. F. Smoot from Berkeley in California, claimed to have found evidence for irregularities in the cosmic microwave background; the CMB.

The CMB is a background radio emission, picked up by radio telescopes. It is thought by most astronomers to be the relic of the light from the Big Bang. Up until now, the CMB has looked completely smooth; telescopes pick up the same amount of power from it no matter in what direction they are pointed. This has puzzled astronomers, because at some stage in the very early universe galaxies and clusters of galaxies must have started to form out of the bland swirls of hydrogen and helium, and so they expect this to leave its imprint on the CMB.

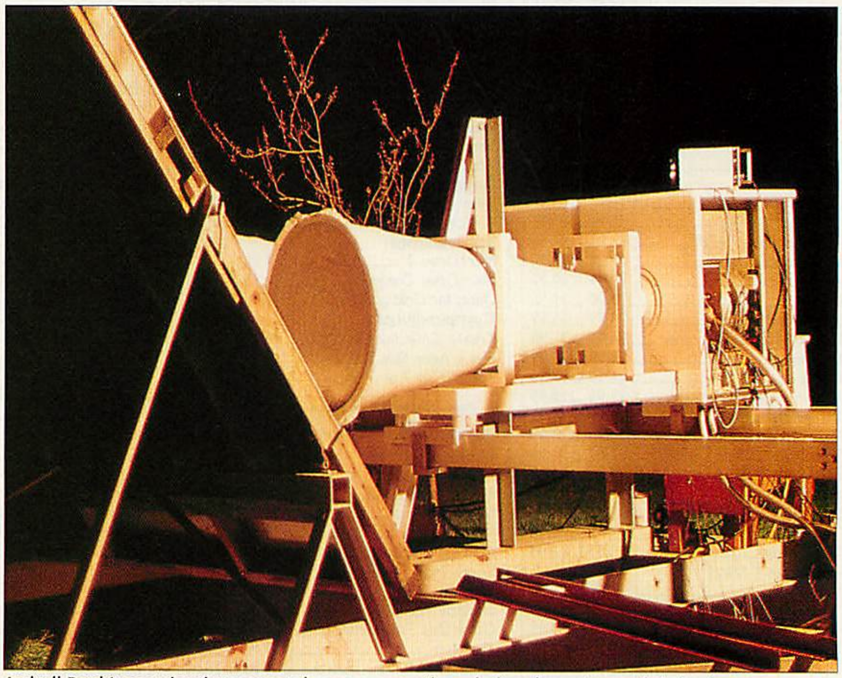
Already astronomers have had to rule out some of the simpler theories of how the early universe behaved, because the imprint left on the CMB would be big enough for us to see. As better CMB-measuring telescopes have been made, still with no detected irregularities, more theories have begun to look a bit shaky. See the box on page 51 for more about the theory.

But now the COBE research scientists claim to have found what we have all been looking for. Unfortunately the way they released their results to the press was a little unorthodox and caused some concern among other astronomers. They even showed a picture of the universe that seems on closer study to be little more than the background noise generated by the radio receivers themselves. However, the group has since analysed more data and published more convincing results in astronomical journals.

By now you are probably wondering what all this has to do with Acorn computers. The answer is that there are several British CMB telescopes as well. Four such telescopes are operated by the Nuffield Radio Astronomy Laboratories, Jodrell Bank (part of the University of Manchester), using Acorn Masters for telescope control and data logging. An A440/1 is used in data analysis.

One telescope is sited at Jodrell Bank and the other three are at an observatory on the Canary Island of Tenerife, where the weather is better for this type of work. Unlike the receivers used in the COBE satellite, we can keep our system up to date with the latest technology. This is not possible for a satellite since once it is launched (or even once the design is fixed) it is usually impossible and always expensive to change anything. Also, we are able to use cryogenic cooling on all our receivers, which requires a supply of helium. Radio receivers always add noise to the signals they are receiving, making it difficult to pick out the signals you want to record. Making the electronics very cold helps to reduce the level of the noise.

Each of our telescopes is actually quite simple, having just two radio receivers. They do not track any particular patch of the sky, but instead let the Earth's rotation sweep a strip of sky overhead each day. Thus there are two signals to be recorded by the computer every minute or so.



Jodrell Bank's cosmic microwave telescope: sometimes being down-to-earth is best

Also there is a calibration source that has to be switched on periodically and the resulting signal levels recorded.

There are various other signals coming from thermometers (just to check on the weather and to see that the telescope equipment is at a well regulated temperature) and power detectors. The computer also has to provide a few control signals to the telescope. All these things are well within the capabilities of the Master 128, adopted for all our CMB telescopes.

Data reduction is a very computer-intensive task. Previously this was done entirely on PDP VAX computers. but for the data from the Jodrell Bank telescope I chose to use an Archimedes. This has a good cost-to-power ratio, and is adequate for all analysis. The more sophisticated methods of image reconstruction, such as maximum entropy, might require more power, but perhaps by then Acorn will have a new souped-up machine.

Another point in favour of the Arc is the ease of transferring the data from the logger computer to the data analysis computer; I just walk across the lab carrying a 3.5in L format floppy. Also, documenting the results using *Draw* files and *Impression* is very easy.

THE HARDWARE

The purpose of our telescopes is to detect any structure in the CMB on scales of around a few degrees. In other words we want to be able to find any blobs of higher or lower than average temperature that are a few degrees across (somewhat wider than the moon, which subtends an angle of about 0.5 degrees).

If we can make sensitive enough measurements, this allows the creation of false colour images of the sky. To make our measurements more sensitive we have to add together the results from many weeks of data collection. Noise is random, so as you stack more and more data together it tends to cancel itself out, whereas the true signals are reinforced.

We operate two types of telescope. The three systems on Tenerife are called switched beam radiometers. They work by measuring the difference in power received from three patches of sky, each separated from the next by an angle of 8 degrees. The three telescopes are similar, except that they work at different frequencies (10, 15 and 33GHz).

The telescope operated at Jodrell Bank is called an interferometer. Interferometry is a way of combining more than one telescope, which can give the effect of using a larger telescope (see box). The technique, widely used in radio astronomy, is important in this case, because the use of two receivers cancels out effects due to the Earth's atmosphere, so putting the Jodrell Bank on a par with COBE, which doesn't have the atmosphere to contend with. In an interferometer, the further apart you have your individual antennas, the higher the resolution of the telescope. The famous Merlin instrument (also based at Jodrell Bank) has its antennas running from Cheshire down to Cambridgeshire. It has antennas up to about 200km apart, and can see detail down to around 1/20th of a second of arc.

The CMB interferometer is rather special, however. These fine scales are less interesting for CMB studies. We are interested in things a few degrees across. This means making an interferometer with the antennas very close together, about a metre apart.

The two receiving horns channel microwaves from the sky (bounced off the mirrors) into each of the radio receivers mounted behind. The horns and receiver units are fixed horizontally, and the mirror elevation angle is adjustable. This allows us to look at different strips around the sky. The signals from the receivers are taken into the laboratory where they are filtered and amplified. Next comes the correlator.

This is where the signals from the two receivers are combined. The effect of the correlator is to produce fringes from any astronomical sources passing through the patch of sky. As a source crosses the telescope the correlator outputs go up and down. In fact the correlator has two outputs, one varying as a sine wave, the other as a cosine wave. This means there is always a big signal from at least one of the outputs when a source is passing through.

DATA LOGGING

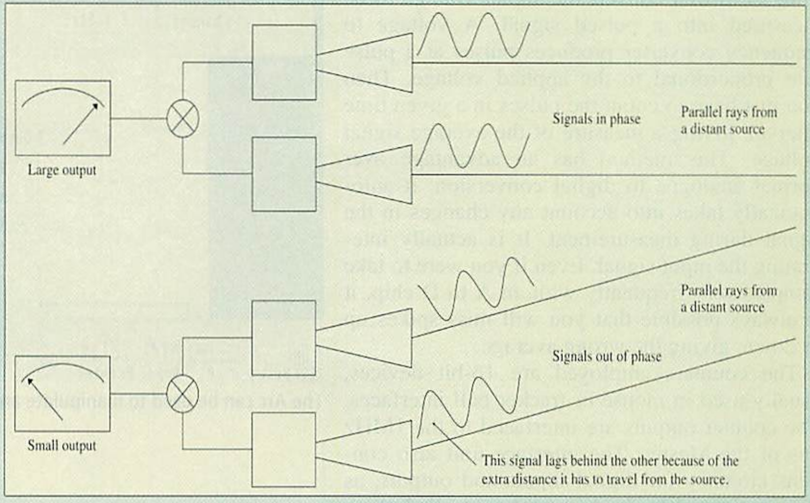
The correlator output signals are recorded by the logger computer. Many of you will be familiar

HOW THE INTERFEROMETER WORKS

Interferometry works by taking the signals (light, radio signals, sound waves, and so on) collected by several receiving elements and combining them. As shown in the diagram below, waves that are in phase are amplified, whereas waves that are out of phase are cancelled out by each other.

Let's take an analogy from sound waves. Imagine setting up two microphones and taking their combined output to a signal level meter. Then set up a signal source, such as a tuning fork, in front of the microphones. The meter reading would be high at the in phase points, zero at the out of phase points and at intermediate levels in between. The angular spacing of these fringes depends on the wavelength of the sound waves and the spacing of the microphones. If the microphones are very close together, the sound source needs to be moved through a large angle to reach the next fringe. With the microphones further apart a small angle makes a bigger difference to the relative distances.

The 5GHz CMB interferometer works in just the same way, with radio receivers replacing the microphones. The two receivers are very close together, so the fringe spacing is large;– a few degrees.



COSMIC BACKGROUND

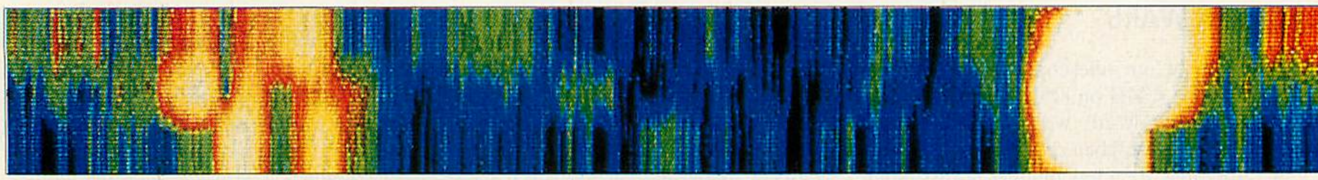
In recent years astronomers have found that space is full of voids and areas in which galaxies and clusters of galaxies are grouped together. One such grouping of galaxies is thought to lie beyond the Hydra-Centaurus system. The Galaxy is falling towards this so-called Super Attractor at an incredibly high velocity because of its gravitational pull. The question astronomers want to answers is where these clumps and voids came from, and how much structure there was very early in the history of the universe.

One of the consequences of light (and radio waves) travelling at a finite speed, is that if we look at things a long way away we are also looking back in time. However, even the quasars, very distant radio sources, are not far enough away to be suitable for directly probing the structure of the very early universe. There is, however, an even more ancient source of radio waves. Discovered by two Americans, Penzias and Wilson, it is known as the Cosmic Microwave Background.

Radio astronomers often quote the power received by their telescopes as a temperature. The hotter the source, the more power it radiates. Even after measuring the losses in their antenna and the radio receiver Penzias and Wilson found about three degrees of temperature at their receiver output was unaccounted-for. What is more, it made no difference which part of the sky they looked. Always they saw the same temperature excess.

The source of these radio waves is believed by astronomers to be the Big Bang itself. In the very early universe there was a lot of light. However, it couldn't get very far because the matter was mainly ionised into protons and free electrons, which are opaque. As the universe expanded, it cooled until, at a temperature of about 3000 degrees Kelvin (3000 Celsius degrees above absolute zero) the protons and electrons began to combine to form neutral hydrogen atoms. This meant that light could pass freely, and start on its long journey to be received by our telescopes. However, in the meantime the universe has expanded, and the light with it. Therefore what started as light has been stretched in wavelength by a factor of about a thousand, to become radio waves. Also, the temperature of the radiation field is 1000 times smaller, about 3K°. Radio waves collected today have travelled mostly unhindered since the very early universe.

Therefore a picture of the CMB can tell us about the distribution of matter in the very early universe, because on angular scales of a few degrees (to which our telescopes are most sensitive) concentrations of matter affect the radiation temperature.



This false-colour microwave slice of the sky shows a mixed bag of objects including a supernova remnant, a possible black hole and several quasars

with data logging equipment using Acorn computers. But because of our special requirements we could not use off-the-shelf equipment. Instead we had to design our own hardware and software. The hardware interface requires some form of analogue to digital conversion. This could be done using an analogue to digital converter chip, many of which are available.

However, another way to do much the same thing is to first convert the signal voltage to be measured into a pulsed signal. A voltage to frequency converter produces pulses at a pulse rate proportional to the applied voltage. Then you just have to count the pulses in a given time interval, giving a measure of the average signal voltage. This method has an advantage over normal analogue to digital conversion: it automatically takes into account any changes in the signal during measurement. It is actually integrating the input signal. Even if you were to take samples very frequently with an A to D chip, it is always possible that you will miss spikes up or down, giving the wrong average.

The counters employed are 16-bit devices, usually used in mouse or tracker ball interfaces. The counter outputs are interfaced to the 1MHz bus of the Master. The interface unit also contains circuitry for digital inputs and outputs, as well as control logic. A crystal-controlled clock circuit produces timing signals for the counters, and drives the software through interrupts.

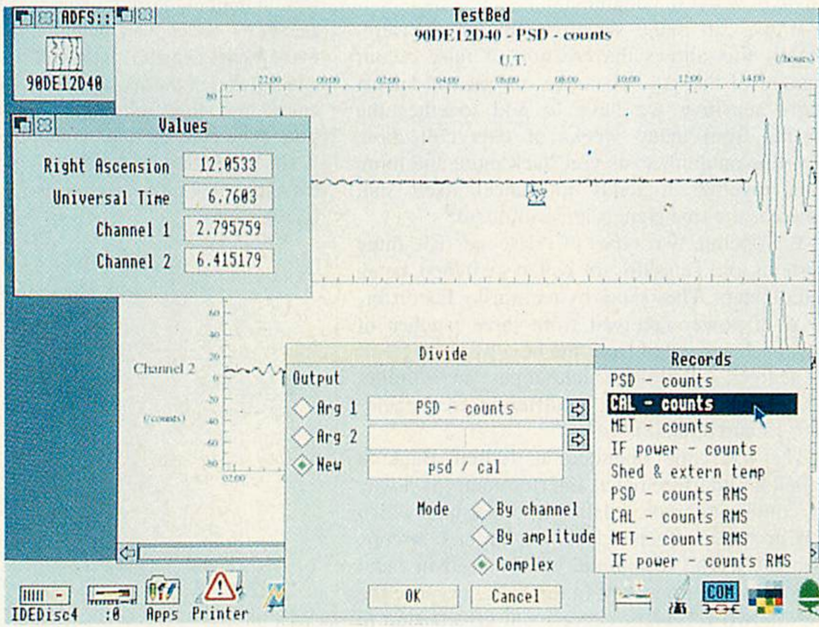
The software was written in machine code by my colleague, Dr E J Daintree. Its primary function is collecting data from the counters and saving them to floppy disc. In the process it performs some averaging and also measures how much variation there is in the data, from one measuring interval to the next. This tells us how much noise there is, so that we can spot when there is interference, or if there is a problem with the receivers.

On the interferometer, data is normally logged every 30 seconds. As well as the normal correlator output signals, there are the calibration signals and various other monitoring and meteorological data. In normal use, a 640K L format disc is filled in just under three days.

DATA REDUCTION

Next comes the Archimedes for data reduction. The Archimedes software is written in C, using Acorn's excellent Desktop C compiler. I was pleasantly surprised at how quickly I was able to pick up C programming for the desktop. I found Dave Acton's articles in *BAU* very helpful, and used some of his code to produce *Draw* diagrams and handling fonts. I was also helped out by radio amateurs over packet radio.

The data files, a collection of digitized signals recorded at regular time intervals, are rather like sound samples. My software is therefore not unlike a sample editor. One of the biggest differences is that you're not likely to want to cut out



The Arc can be used to manipulate and present microwave data in all kinds of ways

a chunk of data from the Cygnus region, for example, and paste it down in Perseus. Nor would it be useful to add an echo!

However, you can delete areas, clip the data and use various special functions. Some of these allow you to reduce the noise level by smoothing the data, or grouping neighbouring points together. It is legitimate to do this because we over-sample the input data (we take many more than the minimum number of measurements required to reproduce the sine or cosine fringes).

As a result we end up with data sets with very little noise, which we can then examine for evidence of irregularities in the CMB. However, most of the signals from the 5GHz interferometer are due to foreground sources, mainly the galaxy itself. In fact the main use of the 5GHz data is to model the contribution of foreground sources, so that it can be eliminated from the higher frequency data.

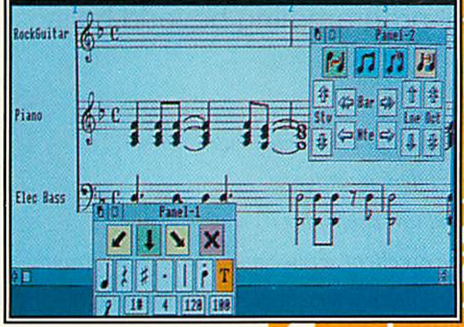
THE FINAL PLOT

In the sample data plot shown in the screen shot above, the large signal on the right-hand side comes from the Cygnus region. Part of it is the Milky Way and part is Cygnus X, a curious radiation source where there is thought to be a black hole. On the left is 3C84, a variable radio source in Perseus.

The false colour image at the top was made by placing a number of one-dimensional strips side-by-side. Again you can see Cygnus on the right, and 3C84 on the left. At the top right is the edge of the Cassiopeia A supernova remnant. In the middle are several very faint sources. These are called quasars (quasi-stellar objects) and are the most distant objects known; so far . . .

PROGRAMS TO BRING MUSIC TO YOUR EARS

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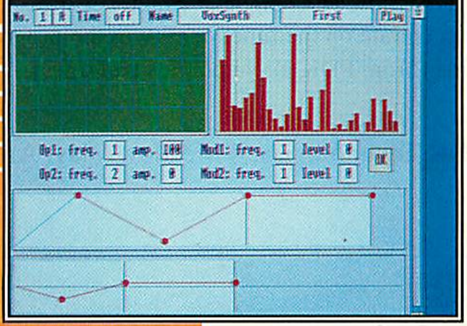


Clares bring you a range of music software that is fast becoming the standard on the Archimedes.

Rhapsody II is a music notation package that allows you to write and modify musical scores. It is to music what a word processor is to words.

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Vox Box is a supporting package for Rhapsody II and consists of four programs. The first, *Perform*, allows you to play Rhapsody II scores, Armadeus samples and Midi files. You can have a continuous performance of your compositions.

VoxBeat is an application to turn sampled percussion sounds into a useful voice module that provides realistic percussion accompaniment to your scores.

VoxSample converts sound samples into usable Archimedes voices. You control which part of the sample is used to create the voice and you can also define the sound's envelope. The resulting voice module is much smaller than the original sample and sounds much better.

VoxSynth is a more complex application that enables you to digitally synthesise voices for use in the Archimedes. Voices are produced by drawing waveforms or harmonics. You even have a form of FM synthesis available. *VoxSynth* is also useful in the science laboratory as it deals with waveforms, harmonics, FFT and FM synthesis.

ScoreDraw £61.95



ScoreDraw is another support program for Rhapsody II. It produces high quality printout of music scores. Together *Rhapsody II* and *ScoreDraw* form the heart of a complete Archimedes based music publishing package. *ScoreDraw* takes a score from *Rhapsody II*, or the original *Rhapsody*, and converts it into a series of Draw files. The results are of true professional publishing quality – especially when printed on a laser printer.

ScoreDraw has its own library of music symbols and it uses these to construct a high quality score. Any text within the score is converted into user selectable outline fonts, if they are available. An additional user library is also supplied which provides items such as hairpins and grace notes.

In addition to improved print quality *ScoreDraw* also concentrates more on the formatting of the score. Because the score is handled differently and *ScoreDraw* is not required to 'play' the score it can spend more time on good presentation.

And there's more... Look out for two more music packages coming from the Clares stable soon. And don't forget our Armadeus Sound sampling board if what you are interested in is recording and manipulating sound rather than music.

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BBC ACORN USER

PROGRAMS

The section that is packed full of exciting programs for you to use

To boldly go where no person has gone before? Well the *Acorn User* team hasn't quite perfected the interstellar warp engine that we're building in the basement (we came across a slight problem), but Fin Fahey has decided to release his navigation system three millennia early!

If you are one of the few people that occasionally look into the night sky in pure wonderment then Fin's program, *SkyWatcher*, which can be found on the monthly disc for 32-bit users, will certainly make you feel a little less belittled by what you see. *SkyWatcher* allows you to project the night sky onto your computer screen, names and all, so finding your star sign or even Uranus is easy as pie in the sky. Being able to point at the sky and call stars by their name is a great way of showing off and good fun too.

I mentioned the slight problem that we had with our warp drive. Well we couldn't work out why we weren't taking off. Then this really clever chappie called Mat Tizard wandered into our office and mentioned something called gravity. We weren't quite sure what he was talking about so we asked him to write an article about it, you'll find it on page 64.

Mat's main program allows you to take a smattering of objects and throw them around masses of varying sizes. From particles to planets, they're all supposed to act in the same way, and the program shows what complex and fascinating interactions can be produced. Animations are produced and then played back in real time. Watch your clusters of tightly packed particles whizz around the heavy masses and then get spurted all over the screen in streaks of light, only to get sucked back into the centre once more in a cosmic dance of chaos. Space was the final frontier, but now you can type it in from the yellow pages. Of course Mat's programs appear on the monthly disc too.

Back down to earth with a solid thud now, as *INFO, the solid mass of programs that it is, embeds itself in your back yard. First of all we start off with the incredibly organic *Biomorph*.

Biomorph simply generates many beautiful fractal-based patterns, generated from data that you can input. OK, we've published many programs like this before but you can always find something different in among the edges.

Want something original that is definitely different? Well we've certainly got that for you; an eight-bit campanology program. Get your bells out and tinkle away as Nigel's program shows you the ropes.

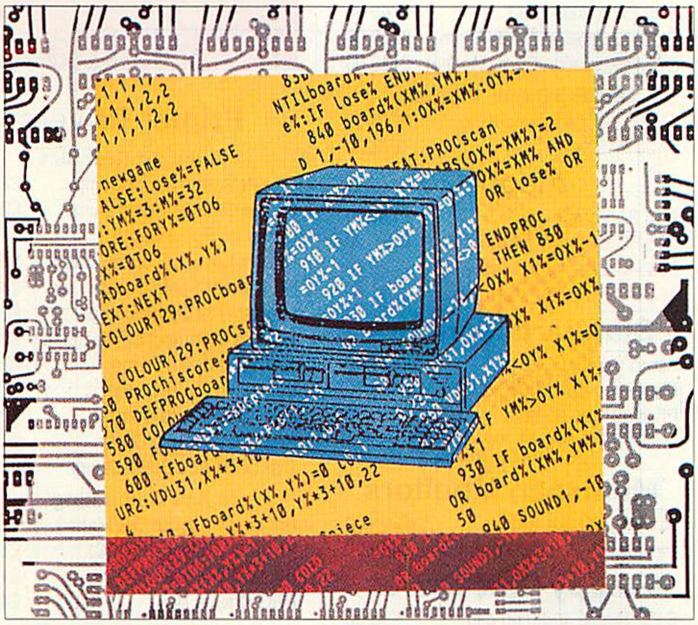
Need I mention that the overworked Jan Vibe makes an appearance with a couple of colourful creations, and the two Daves explain how to customise the Risc OS 3 start-up banner to display what you want. My favourite tip this month shows you how you can drag actual file icons around the screen instead of those boring red flashy boxes.

Of course, if you're just beginning in the programming world then the Daves have something for you. Sprites are explained this month, how to plot them, and how to keep them organised.

The second part of our games series is on page 79. This month Antony Lytis starts to make those moody aliens move of their own accord with an editor that is great fun to play with. Next month you get to shoot the little blighters, and you can choose whether or not they can move out of the way!

The Arm series rounds off this month's *BAU* programming section which finally fades into the very yellow pages, with all those program listings for you to type in.

Paul James



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KEEP WATCHING THE SKIES

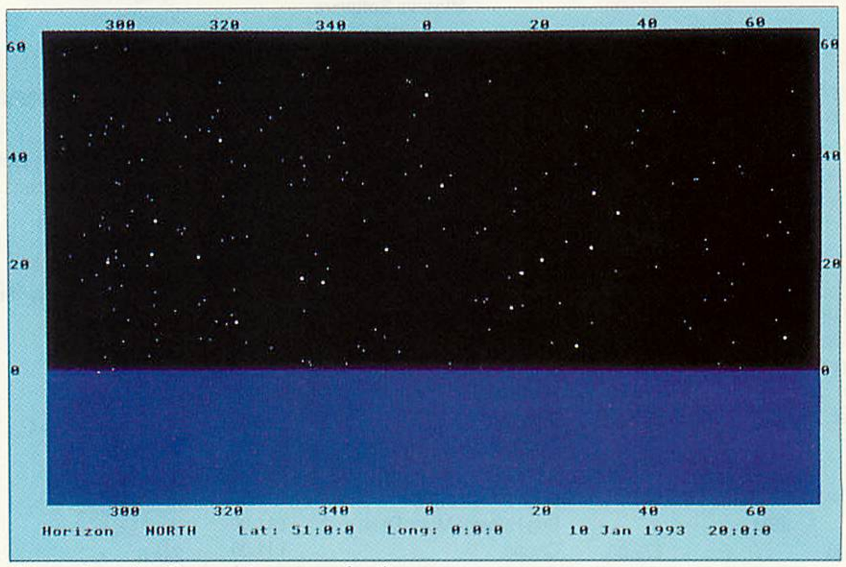
Fin Fahey invites you to take a trip to the stars with SkyWatcher, his software planetarium

Even if you live in a city, and suffer the semi-opaque haze that results from a mixture of pollution, surplus heat and sodium light, the night sky must surely be a source of wonder; even if all you can see is the moon and a couple of planets. How much more exciting, then, when you can name what you see and be know that a faint patch of glowing light is actually a spiral galaxy containing thousands of millions of stars, millions of light years distant.

Skywatcher is an all-encompassing computer planetarium that should improve your familiarity with the heavens. It contains and plots on screen the positions of over 1500 objects, including: all stars down to magnitude 4.5; the sun, moon and planets; and a selection of other objects including star clusters, galaxies and nebulae. As a result, it is so large it won't fit on the yellow pages, and you'll find it on this month's *BAU* subscribers' disc; a great reason to subscribe.

Sky maps are available under a number of coordinate systems, including the all-important viewpoint; you. The program will compute star and planetary positions for your given time and geographical position on the earth.

The program is uniquely configurable to your own given taste. Different displays and systems of nomenclature can be turned on and off at the touch of a button. So, if you simply want to improve your naked-eye familiarity with the sky, or you are armed with a small pair of binoculars and are interested in clusters and nebulae, are looking out for meteors or simply want to know what that bright star over there by the moon is, there's something here for you.



The northern sky: if you can't spot any familiar patterns . . .

USING SKYWATCHER

When you first run the program, there is a short delay while it sets up data. Once this has happened, subsequent computations are relatively fast. The very first thing you see is a map of the sky looking north from latitude 52 degrees north, longitude 0 degrees (approximately London) for your current date and time. Time and position is shown at the bottom of the map.

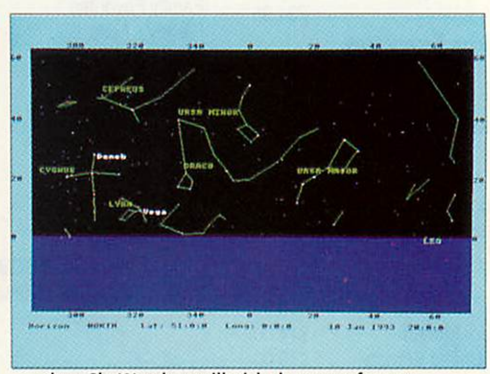
Above the text window at the bottom of the screen is the rectangular map. As you can see from the blue expanse, it is assumed that you are seeing the sky from a mariner's viewpoint. On land, you would expect a good chunk of the sky to be obscured by buildings and trees. The altitude of objects above the horizon is marked up the left and right hand sides of the map, and the geographical bearing or 'azimuth' (North is 0 degrees) is at top and bottom. You can see that this is a big block of sky, about 120 degrees across by 60 degrees in altitude.

All you can see at the moment is a collection of points, some 'brighter' than others (for reasons of speed, *SkyWatcher* uses simple plot routines to show the stars, not sprites). Even so, you may already be able to spot some old friends. See if you can find the Pole Star. No luck? Never mind, just press CTRL-L (see the box on this page for a summary of all *SkyWatcher* commands). This turns the notional outlines of the constellations on and off. You should now be able to spot the Plough (part of Ursa Major, The Great Bear), a shape that everyone knows. The two end stars in the 'blade' of The Plough point towards the centre of the map, towards the Pole Star, the last star in the tail of Ursa Minor, The Little Bear.

COMMAND SUMMARY

F1: north
F2: east
F3: south
F4: west
F5: zenith/north polar
F6: south polar
F7: Altazimuth
F8: Equatorial
F9: Ecliptical
F10: Galactic
CTRL-Z: Zoom
CTRL-U: Unzoom
CTRL-K: Kill all text
CTRL-L: Constellation outlines on/off
CTRL-C: Constellation names on/off
CTRL-E: English translation on/off
CTRL-N: Star/object names on/off
CTRL-A: Star/object letters on/off
CTRL-O: Objects on/off
CTRL-M: Meteor radiants on/off
CTRL-T: Enter time
CTRL-D: Enter date
CTRL-X: Enter longitude
CTRL-Y: Enter latitude
CTRL-S: Save screen

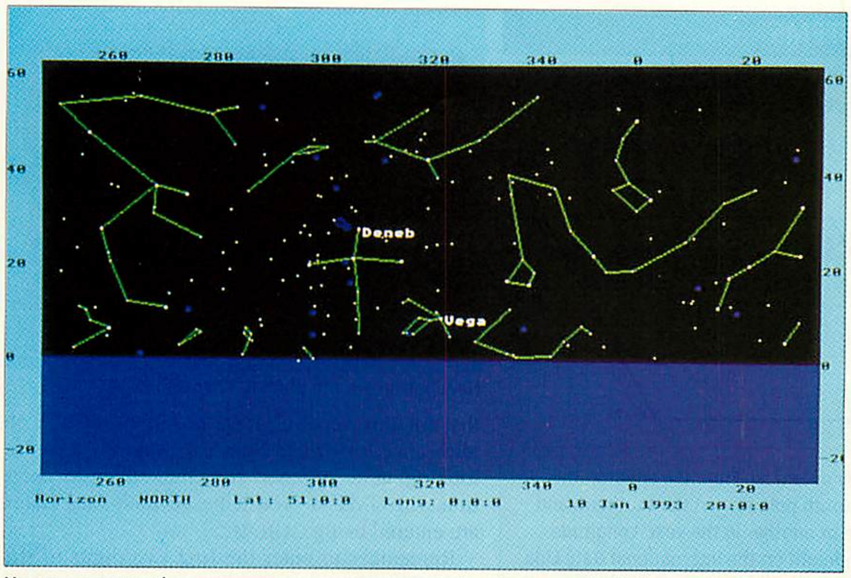
Select centres the map on the mouse pointer



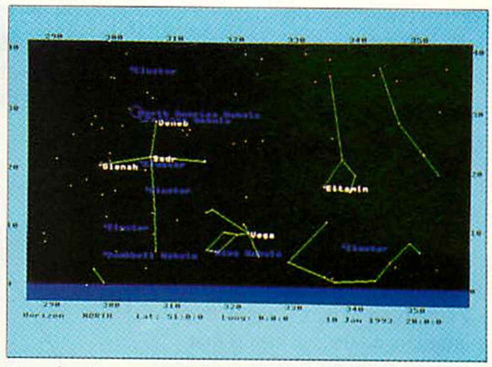
. . . then SkyWatcher will pick them out for you

If you are still stuck – even if you've identified the bears, you may not know what some of the other shapes floating around are – try hitting CTRL-K. This turns on and off the map labels including constellation names, invaluable for spotting lesser known constellations like Camelopardus. The names default to Latin, but if you'd like to know what this peculiar shape is really meant to represent, press CTRL-E, which toggles an English translation of all the names on and off (so that's a giraffe, eh?) Some names don't translate; that's usually because they are people, like Andromeda or Perseus.

But the stars too have their names (and ranks and serial numbers). You may have noticed that



You can recentre the screen on any area you want: star clusters and nebulae are shown in blue



Zooming in reveals yet more detail

NOMENCLATURE

● Constellations: Loose associations of stars that usually have no real connection with each other apart from appearing to be in the same direction in the sky. You may notice that these bear little resemblance to their names (with the possible exception of Triangulum). Modern names are no less fanciful than the ancient ones; I'd defy anyone to see a pair of hunting dogs in Canes Venatici, named as late as 1690.

● Stars: Not all stars have names. Many of the brighter ones were named by the Romans (Sirius, Canopus), but by far the most names were designated by Arabic astronomers (Aldebaran, Algol, Betelgeuse). In 1603 Bayer decided to get systematic and allocated Greek letters to the stars in each constellation in order of brightness; the most famous example is Alpha Centauri, the brightest star in The Centaur. Greek letters are the second level of nomenclature in the program although, particularly in the southern hemisphere, upper and lower case Roman letters are also used.

If all else fails, most stars in the northern hemisphere have a Flamsteed number allocated by John Flamsteed in the 18th century (for example, 61 Cygni). These constitute the third level of nomenclature.

Finally, stars that vary in brightness over time (variables) are designated by a Roman letter between R and Z (for example, T Tauri). When these run out, we go back to the start of the alphabet: AA, AB and so on.

● Objects: An object is anything that looks 'fuzzy', meaning it shows an angular diameter, unlike a star which is always a point, even in the strongest telescope. They include: open clusters, associations of young stars in the plane of the galaxy; globular clusters, vast associations of older stars outside the galactic plane; external galaxies; and nebulae, clouds of gas and dust dark or luminous, free-floating, shells around hot stars or supernova remnants.

Some of these have first-level names, for example the Whirlpool Galaxy or the Pleiades. Over a hundred were given catalogue numbers by Charles Messier, who found them annoying because he was really looking for comets. Many have numbers allocated by Dreyer in his New General Catalogue (NGC). All these are available on the maps. So the Andromeda galaxy is known as either the Great Spiral, M31 or NGC224.

some of the stars acquired strange names next to them. At the time of writing, you would see Deneb in Cygnus and Vega in Lyra show up on the north-western horizon. Only certain stars are named. At this scale, the map would get messy if we displayed designations for everything, and so only the brightest stars have names. Stellar magnitude is a way of measuring the brightness of the stars as seen from earth. It has the peculiarity that the lower the magnitude, the brighter the star. Sirius, the brightest star, is magnitude -1.46, the full moon about -13. To a keen naked eye, everything below magnitude 6 is visible. In this version of the program, all stars with magnitudes below three are large blobs. Above three, they are single pixels.

Just so we've got everything going, please press CTRL-O. All of a sudden, clumps of blue should appear, some of which will be shown as circles. These are non-stellar objects; star clusters; nebulae (gas clouds); galaxies and so on.

SPACE TRAVEL

You may be getting bored looking north, so try playing with the function keys, F1 to F5. The first four give you views looking North, East, South and West. The last gives you a zenithal view; looking directly upwards. You will have noticed in your wanderings that some of the planets, sun and moon have appeared, most likely to the south; the sun and moon are shown in yellow and planets in red.

But we can do better than just these few views. Go back to the north and click the mouse button on any point on the map you wish. You will find that the map will immediately centre on the point you've clicked. Note that if you go too high in the sky on the first four maps, though, the constellations become horribly distorted. This is because we are using a very simple equiangular map projection. Any projection involves distortion, however, and things are pretty good up to about 60 degrees altitude.

We still don't really know what a lot of this stuff is; time to zoom in. Press CTRL-Z, once you've centred the map on a particularly interesting patch of sky, and it will magnify it by a factor of two. You should now find that many stars and objects have acquired names, greek designations or numbers. Non-stellar objects may show real diameters and appear as circles. Not everything has a name and not all names are in common use, but they've all been included for exotic interest. There are three levels of naming. CTRL-N toggles names and leaves Greek letters and Messier numbers, while CTRL-A turns these off and just leaves numbers (see the box on nomenclature).

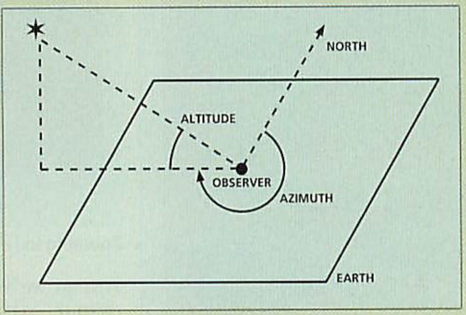
You can zoom in as far as you want by repeatedly pressing CTRL-Z, and CTRL-U will take you back out again. The degree markings will change accordingly. Remember that if everything is getting messy (one of the penalties for completeness), then you can turn anything you want on and off. At a pinch, you can turn off all text by pressing CTRL-K.

Time travel is also possible; if you hit CTRL-T, you will be asked to enter a new time at the bottom of the screen. This is entered in hh:mm:ss format. The program will take a moment to recompute and will display a view in the same direction but for a different time. Note

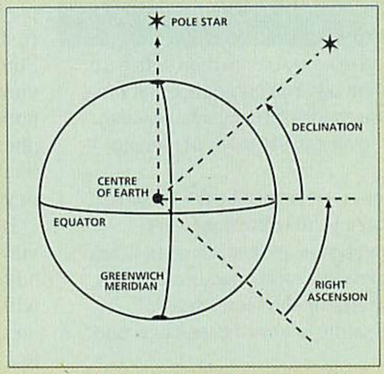
COORDINATE SYSTEMS

There are four coordinate systems available in *Skywatcher*. I have used the convention of enumerating them all in decimal degrees instead of degrees/minutes/seconds (or hours/minutes/seconds for RA).

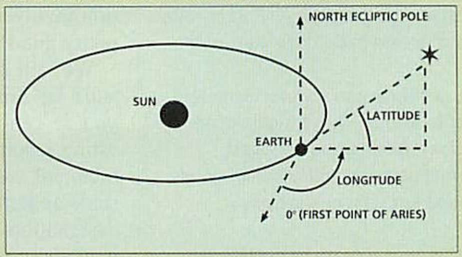
● ALTAZIMUTH: Of most immediate importance, this is basically what you see from a point on the surface of the Earth. Altazimuth views depend on time – the Earth's rotation takes the whole sky past about once every 24 hours – and date – the Earth's orbit around the sun means that midday, the sun's highest daily altitude in the sky moves around the sky in one year. It also varies depending on latitude; from the north pole only half the sky is visible and the pole star is always directly overhead. From the equator, the north pole star is always on the northern horizon, the south pole star on the southern, and everything in the sky is theoretically visible at one time or another in the year. Longitude affects things less, but since midnight in the UK and midnight on the International Date Line occur 12 hours apart, some objects may have moved; for example, the moon may have moved over 5 degrees in its orbit.



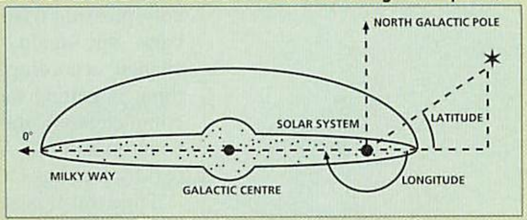
● EQUATORIAL: This is the celestial equivalent of latitude and longitude. Visualise a concentric 'celestial sphere' enclosing the Earth, with the stars as points on it (yes, of course the stars are at different distances, but let's pretend). The equivalent of latitude on the inside of this sphere is known as declination and just like latitude runs from +90 to -90 degrees, with the pole stars at the poles. 'Longitude' is known as right ascension and is usually measured in hours, minutes and seconds (for convenience I have used degrees). An hour is 15 degrees; the angle through which the Earth rotates in one hour.

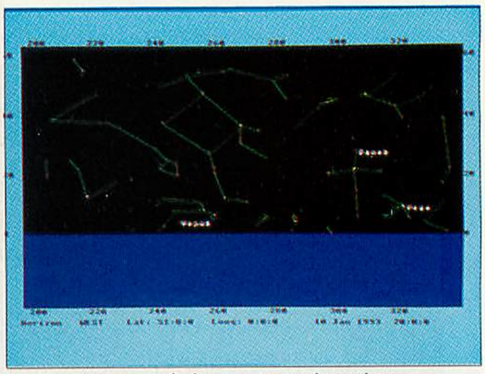


● ECLIPTICAL: Also known as zodiacal. Another 'celestial sphere' to which many of the above comments apply. The difference here is that that, whereas the earth's axis points at the poles of the equatorial sphere, in this case it is the axis of the earth's orbit that is taken into account. Since the earth's axis is inclined by 23.44084 degrees to this, there is a considerable difference between the two systems. This map is useful because by definition, the course of the sun through a year takes it precisely around the equator of the ecliptical 'sphere' (this path is therefore known as the ecliptic, because it is only when the moon crosses the ecliptic that eclipses can occur). This means if you look at the first four maps, you'll see that the 12 signs of the zodiac lie straight along the x axis of the map. Most planets (Pluto is an exception) don't stray far from the ecliptic, so this system is a useful guide to planet finding.



● GALACTIC: If planetary astronomers (and astrological pseudo-scientists) love ecliptical coordinates, then this is the one for astrophysicists. Because of our position out in the boonies of a lens-shaped galaxy up to 100,000 light years in diameter, we can set up a coordinate system based on this. When we look towards the north or south galactic poles, we are looking right out of the galaxy (see diagram). Conversely, the 'equator' on this star map has us looking through the maximum thickness of the Galaxy, producing the line-of-sight effect known as the Milky Way, which runs straight down the centre of maps 1 to 4. You will notice that most blue points (clusters, nebulae and so on) cluster around this plane. Conversely, because visibility is better, we can see more external galaxies at the poles. Zero degrees galactic longitude is defined by the direction of a point in Sagittarius, behind which lurks the centre of the Galaxy.





New patterns – and planets – come into view

that for this version of the program, there is no allowance for British Summer Time, so if you're looking at a summer sky, remember to enter times in GMT or you'll be an hour out. Dates are entered using CTRL-D.

Remember to enter the first two digits of the year. The accuracy of the program when calculating planetary positions falls off within a couple of centuries, but it is fairly exact within about a century either way.

Finally, if you want to look at the skies from somewhere else on the earth (for example to view The Southern Cross), then you can change your latitude and longitude. CTRL-X changes longitude, and CTRL-Y latitude (by analogy with x,y coordinates). Longitude should be entered as positive for east and negative for west in degrees between +180 and -180. All degrees are entered in degrees, minutes, seconds format. Latitude should be also be entered in degrees between plus and minus 90 (positive for north, negative for south).

NEW VIEWS

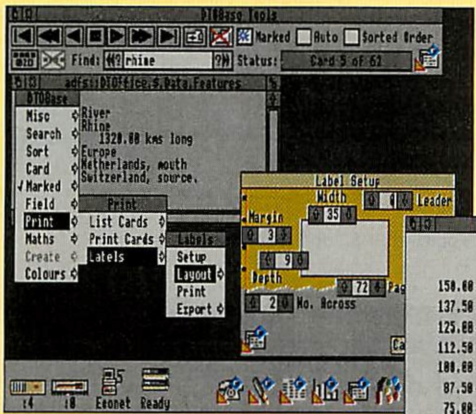
Besides the locally oriented view, *SkyWatcher* offers a number of other views based on other coordinate systems; equatorial, ecliptical and galactic. The function keys F7-F10 select altazimuth (the technical name for the local view we've just been discussing), equatorial, ecliptical and galactic views (see the box for a discussion of these coordinate systems). Because there is no horizon in this case, key F6 is now activated and offers a south polar view to complement the north polar view offered by F5.

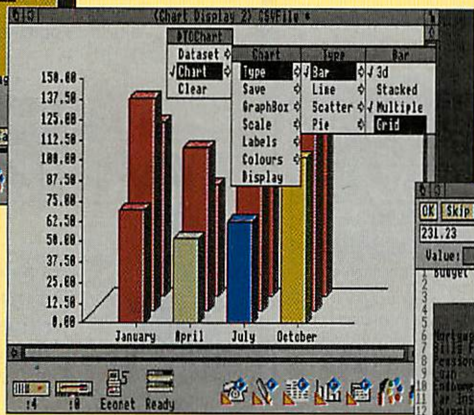
You should now be able to manoeuvre around the heavens with ease, but there are a couple of other facilities available. Pressing CTRL-M may (or may not) result in some purple blobs appearing. These are meteor radiants – points in space where regular meteor showers seem to come from – and if you zoom in you will see that they are named after the constellation they are in. You may not be able to see any, because there are less than 20 such showers annually and they only occur between certain dates; the program automatically checks if there's a shower on.

Finally, you may wish to keep a hard copy of your map. The best way to do this is to save the screen as a sprite. This is done by pressing CTRL-S, which prompts you for a file name. The screen is then saved, and can be printed out using a suitable utility such as *Paint*. You can now go and do some real skywatching; staring at a computer screen is no substitute, no matter how good the program is.

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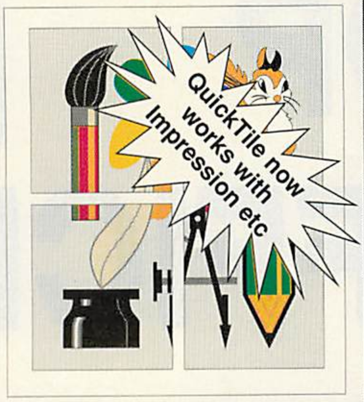
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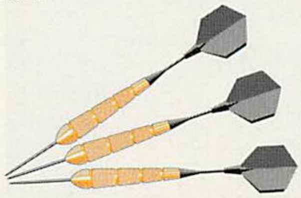
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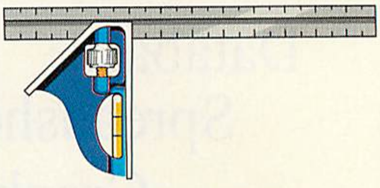

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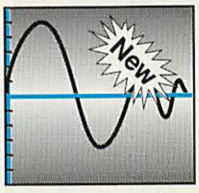
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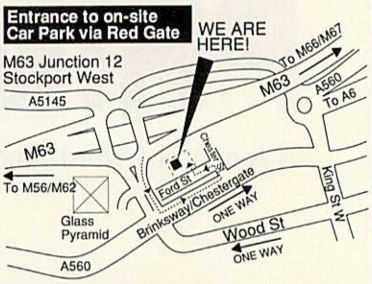
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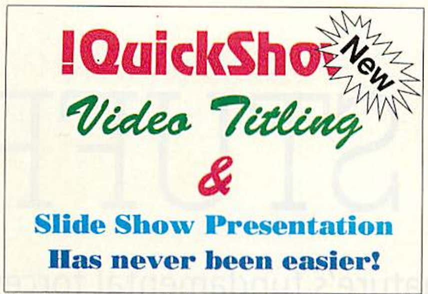


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Archimedes Internal hard discs. Not suitable for the A3000

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120Mb 16ms Cache	£299
200Mb 13ms Cache	£399
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A3000 Hard Cards

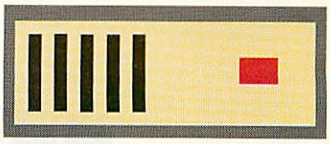
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Archimedes, A3000, A5000 Software

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Access VISA SWITCH

MAR 93

HEAVY STUFF

Mat Tizard tinkers with one of nature's fundamental forces

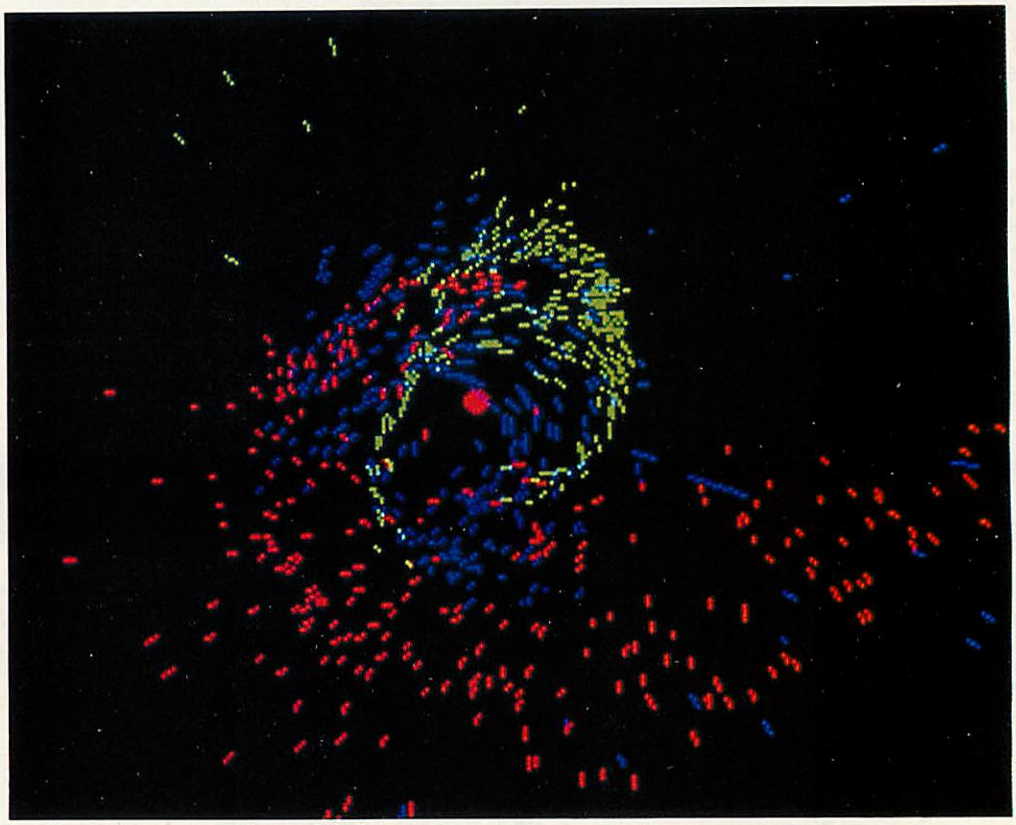
Gravity is the most apparent of the four 'fundamental' forces that physicists now acknowledge, and yet it is the least understood. Newton's theory says that the closer two objects are, the more powerfully they will be drawn together, but this is not how most people visualise gravity.

We develop an intuitive understanding of the force of gravity because it is what keeps us on the ground and what makes toast fall butter-side-down and so on, yet this is the same force which keeps the moon going round the earth and glues the universe together on a large scale. The short listing *FieldLines* plays a brief film to illustrate this shift in perspective; from a force which acts towards the centre of the earth and one that seems to act 'downwards' to us.

The electromagnetic forces that stick matter together internally are something like 10^{37} (one with 37 zeros) times stronger, yet gravity is still the most influential force, mainly because it is always attractive. This means that at long ranges, positive and negative electromagnetic forces cancel each other out, while gravity still operates. Electromagnetism really comes into its own at atomic scales, where it governs the behaviour of the shells of electrons surrounding atomic nuclei.

Inside nuclei themselves, the other two fundamental forces so far known, the strong and weak forces, make their presence felt, but gravity remains the one force that is immediately evident to we who live in the macrocosm. Newton understood the far from obvious fact that celestial matter is subject to the same forces that affect things down here on Earth.

We've run articles on gravity before (see Colliding Galaxies in *BAU* July 1989 and June 1990), and this one will give you a hands-on feeling for the force itself.



Every particle has a role in the cosmic ballet

BACK TO BASICS

Before we can start playing God, our universe must be divided into two classes of matter: heavy objects and light objects. This is done because it dramatically reduces the computer's calculating workload (the light objects have a negligible effect on heavy objects).

For convenience, the heavy objects are fixed in space and only exert their gravitational force on a collection of clouds or 'clusters' of extremely light particles. It might be helpful to think of the heavy objects as stars and the particles as dust. The listing *Gravity* in the yellow pages allows you to set up a system of particles in two dimensions and tailor it to suit yourself. Despite the fact that it sounds like a crude and clumsy force, with a little encouragement, gravity is capable of teasing structure out of seething chaos, as it did in the early universe.

Every one of our particles has associated with it a position, and a velocity vector which tells us how fast and in what direction it is moving. You have the option to view the particles on-screen as clouds of points, circles or blurs (which leave a trail behind them). For small numbers of particles, circles are best since they are easily visible, but for lots of particles, use blurs every time.

With this option you are effectively watching swarms of vectors on the wing, since all the information about each particle is actually visible.

THE SIMULATOR

Before running the program, you should use the Task Display to allocate as much memory as possible to the 'Next' area. We need the memory because we are going to be recording a sequence of pictures of our particle system as it changes over simulated time, and then stringing them together to make an animated film.

Initially, you can either design your own system or have a look at one of the five already installed as demos, which will give you some idea of how the finished films look. Designing your own system is a simple matter of specifying where the heavies and clusters are initially and how the clusters are moving. Once the system is defined all you need to do is set it going, then let gravity do the rest.

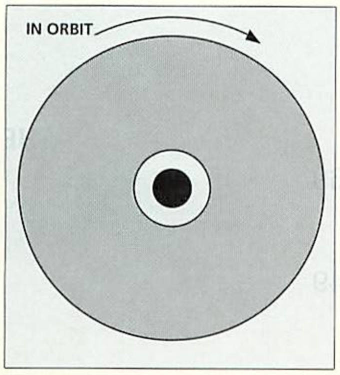
The computer will ask a few simple questions about the system and what it contains. If initially you wish to skip these questions and get straight to the designing, you can press the F1 key. This shortcut just tells the computer you want a simple system with one heavy and one cluster containing some 200 particles.

From the questions, you go to a grid on which the system is schematically laid out. Messages at the top of the screen guide you through the design process, with keypress options shown in brackets; for example, pressing F when fixing the arms of a cluster will define the full 360 degrees.

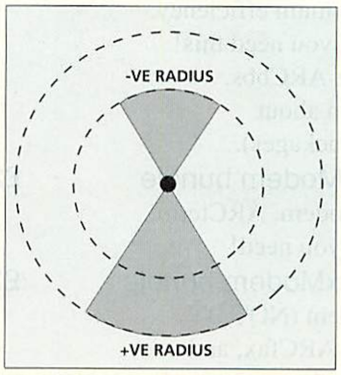
First, fix the positions of the heavy masses. In real life, matter always attracts other matter but here you have the option (by clicking with Adjust instead of Select) to create blobs of 'antimatter', with negative mass, which repels the particles instead of attracting them. This strange stuff is denoted by an empty circle instead of a full one.

Remember that every extra heavy means a lot more calculation (since its influence on every particle must be considered) so, as a rule, only use more than three if you have fewer than 200 or so particles in total.

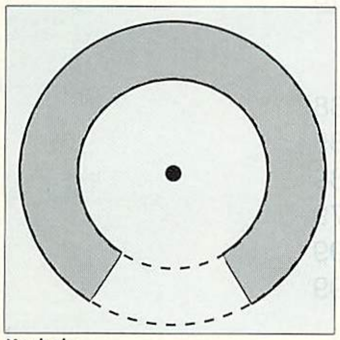
Next, click on a reference point that will be the 'centre' of the first cluster. Around this centre you specify two radii and two angles (in yellow) within which the particles of the cluster will be scattered and enclosed. A wide variety of cluster shapes can be created using this versatile system, especially when you remember that negative radii are permitted (again, click with Adjust instead of Select).

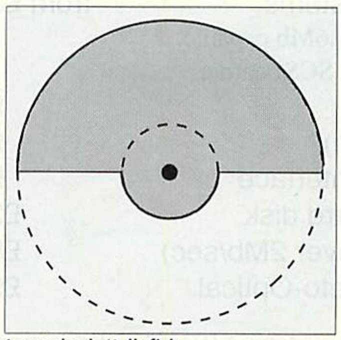


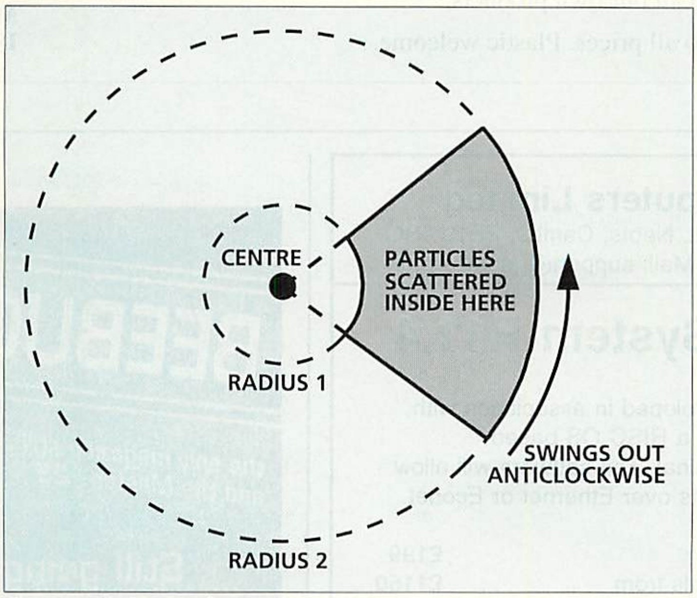
Galaxy



Butterfly


Keyhole


Lampshade/Jellyfish



Clusters come in many forms

The use of an radius range which spans from negative to positive will give rise to a two-sided 'butterfly' shape. The convention is that clusters are swept out anticlockwise from the first arm, and a short indicator bar protrudes from the diagram to indicate this.

The motion of clusters is defined in a similar manner (in blue): two magnitudes and two directions are specified which restrict how each particle might be moving initially. Alternatively, a cluster can be still to begin with (press S) or in orbit around a given heavy (press O). When a particle moves in a circle at a constant speed, its velocity is changing (since its direction is changing).

This means that, rather it is actually accelerating towards the centre, even though it remains at a fixed orbital radius at a constant speed. If there is no force to provide this acceleration towards the centre (such as the tension in a piece of string, or gravity) the particle will fly off at a tangent. Mathematically speaking, a particle is known to be in orbit when the force providing that acceleration towards the centre is exactly equal to the gravitational pull of the central mass.

Do bear in mind that the presence of more than one heavy will sabotage any orbits you have defined (but will unravel some interesting and elegant structures). 'Galaxies' can be defined by positioning a central heavy and then creating a concentric ring-shaped cloud in orbit around it. Orbits can be set to be clockwise or anticlockwise if you click with Select or Adjust respectively.

It is worth taking the time to practise, and get the hang of flinging particles about. Then you will be able to aim your clusters more skilfully, so that they skim the edge of a heavy and exhibit interesting behaviour as gravity gets a grip. Sometimes you will see the striking transition between those areas which are left unscathed and those unfortunate particles which are sucked in and spat out like so much cosmic jetsam.

MAKING MOVIES

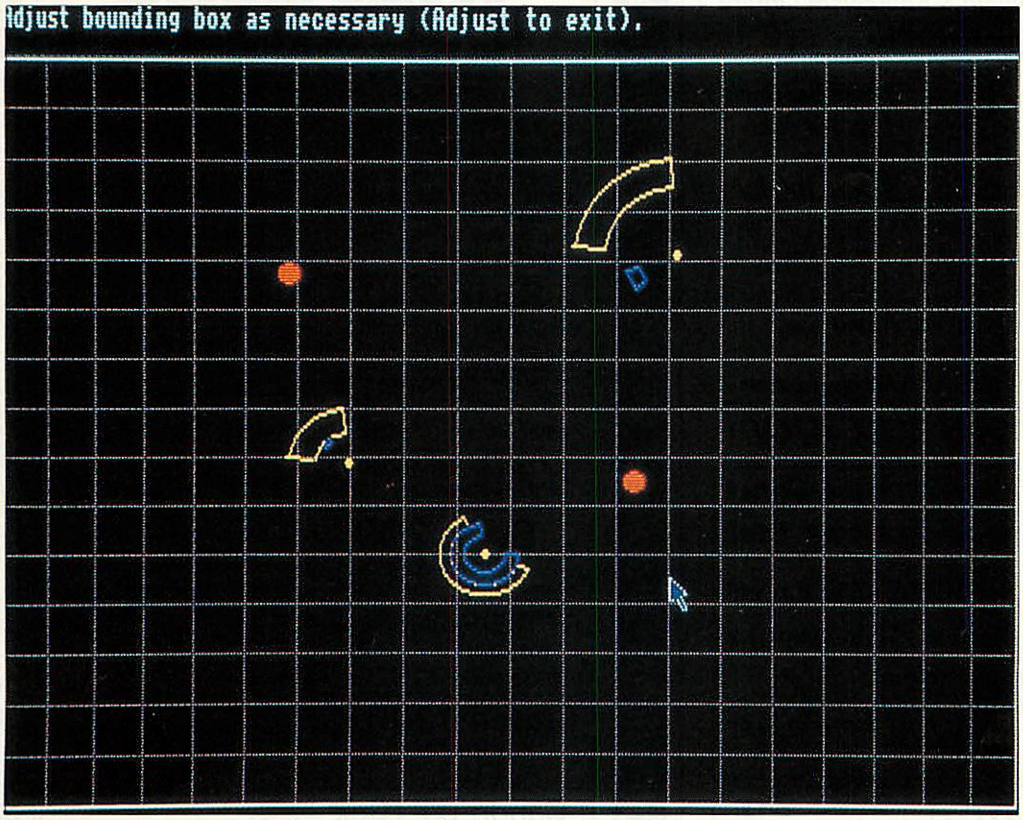
To maximise the length of the movie, the program only 'photographs' a given area of the screen inside a bounding box. The best way to position the box is to run a test simulation with only a few particles, then see how the system behaves to determine where the main area of interest is.

For economy, it is best to use a four-colour mode at a resolution that suits your memory capacity (modes 1 or 8 are recommended for machines with 1Mb or 2Mb). There are two methods of shooting the movie. The first way is simply to record sprites of the system at each tick of the simulation. This is very wasteful of memory, but it does mean that a simulations of fearful complexity can be filmed and replayed at up to 50 frames per second.

The other method is best used for simulations with under 200 particles, and it uses machine code to regurgitate the positions of the particles so quickly, the illusion of movement is created. This brute-force method is more useful for machines with an Arm3.

If desired, you can make the particles ricochet off the edges of the bounding box. A damping factor, (between 0 and 1, set in line 430) reduces their velocity accordingly when this happens. This bouncing feature can be useful to stop particles from flying away in simulations containing a lot of antimatter. A system of proximity detection stops those particles which pass very close to a heavy being flung away at ridiculous speeds.

This is included to curb the temper of the inverse-square law, which can become violently strong at close range



Designing your own gravitational simulation is a simple matter

HOW GRAVITY WORKS

The heart of the *Gravity* program is a routine called PROCcalculate. It works on the basis of straightforward trigonometry (see diagram below). Angle a is the same in both triangles, so we can reason that since:

$R=(dx^2+dy^2)^{1/2}$,

so . . .

$R^3=(dx^2+dy^2)^{3/2}$

Now:

$F=G/R^2$ . . . where G is the gravitational constant

We know from the position triangle:

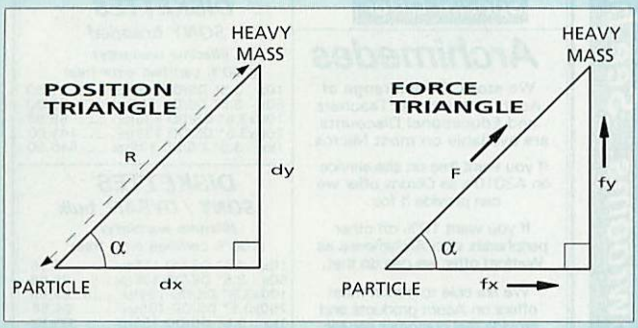
$\cos a=dx/R$ and $\sin a=dy/R$

So by Pythagoras. . .

$fx = (G/R^2)\,(dx/R) = G \times dx/R^3$

and . . .

$fy = (G/R^2)\,(dy/R) = G \times dy/R^3$



(imagine a fraction with a very small number squared on the bottom). The strength of the gravitational field generated by each heavy can be customised by changing the value of the constant G% in line 440.

The finished film is shown automatically when the available memory is filled, or the simulation can be interrupted if you get tired of waiting. A counter in the top left hand corner – which is not itself recorded – shows the fraction of the animation completed. It is a good idea to establish a particle system you are happy with, run a few tests and then leave a really meaty simulation running overnight, containing thousands of particles.

PROCanimate can be called to display the film later on (as long as variables remain set and you are in the correct mode). During playback, pressing the Adjust mouse-button will slow the frame rate down from 50 to 25 per second, and holding down more buttons will slow it further.

Obviously, the more memory you have, the longer your film can be. With 2Mb, you can store about 300 frames of a 600×600 box with three clusters of 500 particles (in Mode 1).

MATHS

The program works by treating time as a series of slices; one for each frame. The number-crunching heart of the simulation is PROCcalculate, which looks at each particle in each cluster and works out its distance from each of the heavies.

Armed with this information, Newton's equation can be employed to calculate the horizontal and vertical components of the resultant force on the particle at that moment, and thus components of its acceleration. Acceleration is defined as 'rate of change of velocity', so we simply add the acceleration components to their velocity components.

Likewise, the velocity components are added to the current co-ordinates of the particle, updating its position. So we have a straightforward, iterative method of keeping track of everything in the simulated universe.

If you're looking for something to keep you occupied over a few of these long winter evenings, and would like to see the program produce the films more quickly than Basic can manage, why not try writing PROCcalculate in Arm code?

I haven't had the time to write an eight-bit version of the simulator, but there's certainly no reason why the mathematical principles in this version shouldn't work on the Beeb (if a little slower).

While you're about it, you might like to try incorporating Richard Talbot-Watkins' splendid Beeb sprite-compression routine to provide true animation (*BAU* Dec 1992). You should get results almost as good as those on the Arc.

MUTUAL ATTRACTION

The program I have been describing is fairly limited, but great fun for getting a handle on the way gravity feels. A more accurate simulation wouldn't cut any corners and would cause every particle to have an effect on every other particle. This proviso creates absolutely horrendous computing demands.

Indeed, scientists studying the early universe and the way in which gravity helped it to congeal use the world's most powerful computers, running for months at a time.

The listing *MutualAtt* demonstrates just how complex things become when you combine feedback with iteration of the gravity equations. The program shows the motion of two mutually attractive particles, or more if you change the value of masses in line 160. You can see that things slow down pretty quickly with more than a handful of masses.

The motion of two particles which influence each other is entirely solvable algebraically, but for three or more there is no better way of examining the situation than by doing what the program does: see where they are, what forces are acting and where they should move next. If the computer is fast enough, what emerges is a smooth ballet of gravitation.

*INFO

Dave Lawrence and Dave Acton present their monthly mix of programs for all Acorn users

STAR PROGRAM

BIOMORPH 2

Program: BiomorColD
Description: Fractal demo
Author: Colin McAskie
Machine: 32-bit
Listing: 135 lines m/c

Colin McAskie sent us a discful of variants on a fractal program from March 1991. The original, *BioMorph*, by A F Reysenbach, appeared in Risc Revue, *INFO's predecessor. Colin has suggested many ways in which the basic fractal can be altered and his listing *BiomorColD*, although only very short, can produce a huge range of spectacular images. There are twelves sets of pre-recorded images stored as DATA statements at the end. These are just constants used in the short machine-code routine that generates the fractal.

By default the program will cycle through these fixed images with a short pause in between. Press D during this pause to toggle between DATA and RANDOM mode. In the latter, the parameters are set to random values. Some random combinations may occasionally 'hang' the program but you can press ESC at any time to skip to the next one. Press S to save the screen. Saved images are given filenames *Bio1*, *Bio2*, *Bio3* and so on.

THE BELLS, THE BELLS!

Program: Bells
Description: Campanology
Author: Nigel Thomas
Machine: All
Listing: 380 lines Basic

This program must surely win the prize for the oddest sub-



All your fractal favourites appear, courtesy of Biomorph

mission to *INFO; an eight-bit campanology simulator from Pasadena. But, none the less, Nigel Thomas earns himself a princely £40.

The program allows you to enter, edit and play up to 16 'methods' (patterns of changes). The practice mode allows you to follow the rings of any one bell, and even take control of it, so you practise your changes without freezing your bells off. The program *Bells* stores methods in 'Place Notation'. This is a compact way of recording change ringing methods. Bells are numbered in descending order of pitch with bell ten denoted by O (or 0), bell eleven by E and bell 12 by T. Positions in the row of bells are numbered in a similar way.

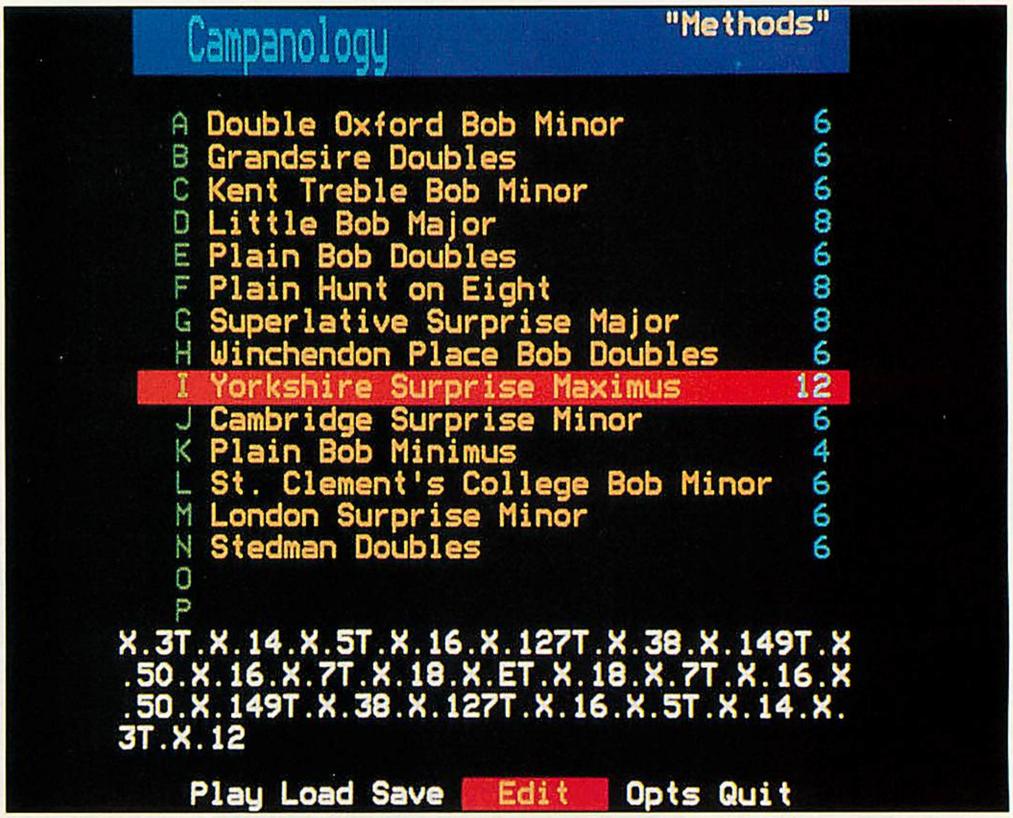
All methods begin by playing 'rounds'; the bells sounded in descending order of pitch. During rounds, the bell number and its position in the row correspond. But when the changes are rung, pairs of bells swap their order according to the next row in the place notation.

In place notation, rows are separated by a period ('.'). If the notation is an 'X', then each bell swaps with its neighbour, so position 1 swaps with 2, 3 swaps with 4 and so on. If instead of an 'X', a number appears in the notation, then the bells in those positions are held; they do not move, but the rest swap as normal. The folowing table illustrates some typical changes. The brackets contain the place notation that will be applied.

1 2 3 4 5 6 (X)
2 1 4 3 6 5 (16)
2 4 1 6 3 5 (X)
4 2 6 1 5 3

When each row in the notation has been played, it starts again from the beginning. If properly written, this should eventually bring the bells to the end of the course with all changes rung and with the bells sounding in descending order of pitch; ready for rounds.

Most campanologists do not use place notation but have the order of the bells in each row written out in full, with the path of the treble (highest pitched) bell marked out from row to row with a red line and the path of the bell they are playing in blue. The program simulates such a display while a method is playing, but place notation is a much more compact form for storage.



The arcane art of bell-ringing is alive and well in Pasadena, CA

The main screen of the program lists the methods loaded. These can be selected with up and down cursor keys or by pressing the appropriate letter. Menu options along the bottom of the screen can be selected with left and right cursor keys and RETURN or by pressing F1 to F6.

To enter a method, choose an unused method line and select *Edit*. You should type in the name of the method. Cursor keys, DELETE, COPY (for delete right) and CTRL-U can all be used. SHIFT-UP and SHIFT-DOWN allow you to change the number of bells, from four to 12 in steps of two. ESC aborts and RETURN will store the name. You can then type in the place notation for the method. All the standard editing keys can be used.

Pressing RETURN will check the notation to make sure you haven't used too many bells and then store the notation. As with name editing, SHIFT-UP and SHIFT-DOWN alter the number of bells. To edit an existing method, press F4 – you can then edit the notation. To alter its name, press SHIFT-F4. To delete a method simply delete its name (with CTRL-U). Figure 1 contains some sample notations for you to enter. More can be found on the monthly disc.

To play a method, press F1. You will be asked to select a bell to follow (in blue). Either type its number or select it with cursor keys, then press RETURN. Rounds will then be rung until you press the C key, at which point the place notation will swing into action and the changes will be rung. ESCAPE or F6 returns to the main menu.

To practise your ringing, select Opts, and switch the 'bell delay' on with the left and right cursor keys. This selects the delay between you ringing the bell and it actually sounding. (Up and down cursor keys on this screen vary the volume of the bell). With a suitable bell delay selected, playing the method will now miss out your bell and you will have to ring it yourself by pressing SPACE; but don't forget about the delay.

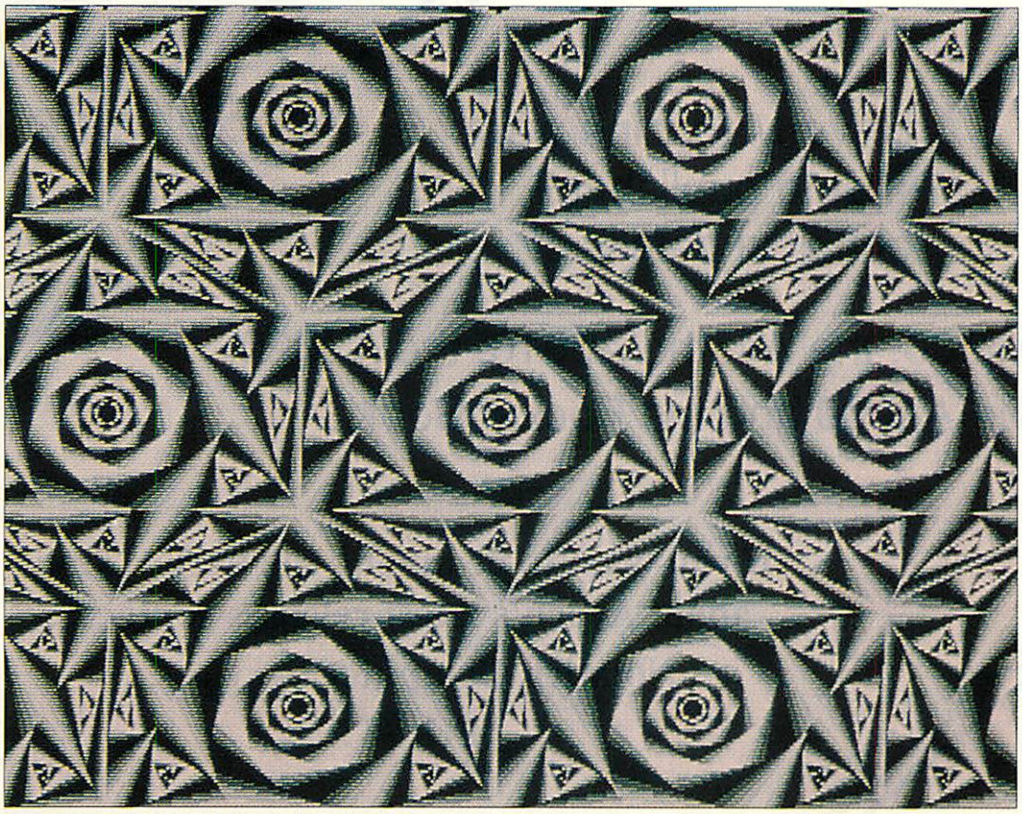
To save a file of methods, press F3. This will prompt you for a filename. The program automatically tries to load a file called *Methods* when it starts. To load a file otherwise, press the F2 key.

There is another short program supplied call *MethPrt* that simply takes a file of methods and prints out their names, number of bells and place notation.

Note for 32-bit users: *Bells* will run on 32-bit machines, but does not look amazing pretty, since it runs in Mode 7. A single sound statement is used to produce the 'bell' on channel 1, so you may like to load a sample of a real church bell and re-assign voice 1 (with *ChannelVoice) to produce a more realistic sound.

SIX EXAMPLE METHODS

- Grandsire Doubles (six bells): 3.1.5.1.5.1.5.1.5.1
- Plain Hunt on Eight (eight bells): X.18
- Winchendon Place Bob Doubles (six bells): 345.1.5.123.5.123.5.1.345.125
- Plain Bob Minimus *(four bells)*: X.14.X.14.X.14.X.12
- St. Clement's College Bob Minor (six bells): X.16.X.36.X.36.X.36.X.16.X.12
- London Surprise Minor (six bells): 36.X.36.14.X.12.X.36.14.X.14.36.14.X.14.36.X.12.X.14.36.X.3-6.12



Polypat: Jan Vibe's monthly assault on the human mind

IN DETAIL

Jan Vibe's latest demo uses recursion to plot a shaded star. First a random colour is picked for the centre of the star (cc%). Then the number of points (pts%) is input. This must be a factor of 360. Then the main loop is entered. This simply plots two triangles for each point of the star; one towards the centre and one outward-facing. *PROCct* is called to plot each triangle and takes twelve parameters; four for each corner of the triangle. These consist of x and y co-ordinates, a colour and a weighting. The weighting determines how quickly the colour of a triangle changes.

PROCct copies the twelve parameters into three arrays; one for each point (p1(), p2() and p3()). Then a GCOL 80 is issued so that the giant ECF pattern will be used to fill the triangular segments. You may remember that the giant ECF pattern is made up of the four normal patterns arranged side by side. *PROCt* is passed the three arrays and it is this procedure that actually does the plotting.

PROCt begins by finding how big the triangle is. The variable l contains a measure of the size. If greater than 2000, the triangle is simply split into four smaller triangles. The colours and weightings are averaged so that the four smaller shapes will join together smoothly. This is a classic example of the 'divide and conquer' approach to programming.

If the triangle is small enough, the array c() is set up to contain the weightings for the three corners. Then the ECF patterns are built up one by one. Each pixel of the patterns is coloured randomly taking into account the weights for the three corners. Finally the triangle is plotted with two MOVEs and a PLOT 85.

GOOD VIBES

Programs: PolyPat, ShadeStar
Description: Graphic demo
Author: Jan Vibe
Machine: 32-bit
Listings: 115, 90 lines Basic

A pair of graphic oddments from our most regular regular Jan Vibe. You'll also find his *1LKlee* in one-line corner.

Shadestar uses ECF patterns and some recursion to plot a shaded star. This listing is the subject of this month's In Detail box for those who would like to know how it works. *PolyPat* fills the screen with a curious pattern of polygons. We though it would be nice to cycle the colours, so borrowed the technique from one of Jan's earlier offerings. We hope you like the result.

PLAYING AROUND

One activity that seems to have declined with the advent of the Archimedes is that of the 'software patch'. Back in the dim and distant past, the pages of *Acorn User* used to be jam packed with amazing little utilities that intercepted unusual vectors and made your machine do all sorts of weird and wonderful things.

Over the last couple of months, we at *INFO have been reviving the art of the software patch and would like to present here a small selection of the most interesting.

We start the 'patching' with the banner that is displayed just before the desktop starts up. This normally says:



Many people find this irritating, but here are a couple of things you can do about it. Firstly, and simply, once th desktop has initialised, press F12 to enter the command line and type *SaveFontCache DTfonts. If you then include the line *LoadFontCache DTfonts in your boot up sequence, you'll find that the banner is drawn considerably quicker. The function of the two star commands should be self-explanatory and therefore you should be able to work out why the desktop starts up quicker. Of course, it would make a lot more sense to put the DTfonts file somewhere sensible rather than leaving it in the root directory, but we'll leave that part for you to work out. . .

If you find the whole banner concept annoying, then you'll probably appreciate the module DTwelcome. This should be loaded within your boot sequence. If you do nothing else, it removes the start up banner completely, leaving you with a grey screen.

It does this by intercepting service call Desktop_Welcome (number &7C). If you claim this call (as this module does), it allows you to replace the default banner. DTwelcome is a little bit more versatile than this, though, as it allows you to replace the banner with a sprite of your choice.

To do this you should set the system variable Welcome$Sprite to the name of a sprite file. The first sprite within this file will be plotted in the centre of the screen instead of the default banner. If the file does not exist, or isn't a sprite file or there are no sprites in it, or there is insufficient RMA to load it, nothing is plotted.

The process of plotting the sprite is made quite complicated as it must be centred and converted from the mode it was defined in.

OS_ReadModeVariable is called a number of times to calculate the size of the screen and the size of the sprite in external co-ordinates. These are then used to work out where to plot the bottom left hand corner of the sprite so as to centre it. ColourTrans_SelectTable is used to build a so called 'Pixel Translation Table' that allows the sprite colours to be plotted as accurately as possible in the current mode

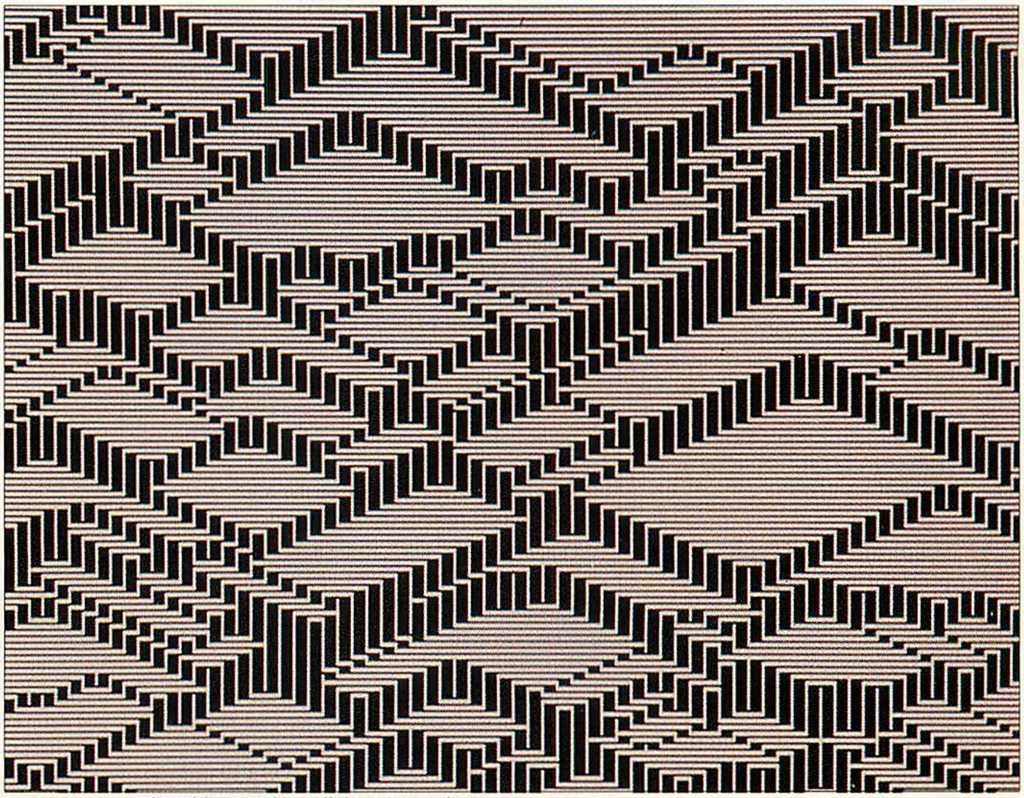
Another way of attacking the banner is a little more sub-

tle. If you open the root of the resource filing system and look in the directory *Resources.Desktop*, you'll find a text file called Messages. If you load this file into *Edit* you should see some familiar lines of text.

Of course, you cannot simply edit this file and save it back as you cannot write to Rom. Unfortunately, it is also not possible to save this file on your hard disc and point Risc OS at the altered file as no system variable is used to access this file.

Instead, we have to cheat a little. In the November 1992 issue, we carried a utility called *Register* that allowed you to place files within the resource filing system. If you make some changes to the messages file, save it somewhere (as *Messages*) and then use Register to store it in *$.Resources.Desktop*, loading the module that *Register* saves will actually overwrite the original messages file and the start up banner will display your messages.

The line beginning with 'Pre:' is printed below the banner box on the grey background. If you were feeling clever you could write an intelligent module that displayed, say, the time in the startup banner when the desktop started up. The lines within the box can be any length; the box will be scaled to an appropriate size.



No Klees as to what this is; and it's all done in one line

MODUS OPERANDI

While are delving about in *ResourceFS*, have a look at the messages file in the *Palette* directory. The third and fourth blocks of text together define the selection of modes that can be obtained from the palette icon. Block four (beginning with the line Mode012 . . .) contains textual descriptions of the modes of the form <name>:<text>. Text is what is shown on the mode menu and the name is a handle for that mode.

Block three describes the modes to be included on the menu. Each line in this block describes the modes for one monitor type: L01 for type one (multisync); L02 for type two (hi-res mono), and so on. The list consists of a comma separates entries of the form . . .

<mode><space><handle>

. . . where <mode> is an actual mode number and <handle> one of the handles defined in block 4. One common complaint is that modes 28 and 31 are missing from the multisync menu, but by adding in '28 Mode028, 31 Mode031' you can correct this 'problem'. Likewise, if you have any extension mode modules that provide large screens, these can be added to the menu and save you having to type in their numbers.

The only thing left is to actually install these changes. Luckily there is a system variable called *Palette$Path*. Copy the entire *Palette* directory (Messages and Templates) on to your hard disc, edit the *Messages* file as you wish and then alter *Palette$Path* within your boot sequence to point to the new files (*Set Palette$Path adfs::4.$.Hard.Palette.). Make sure you include the final '.' and you'll now be able to use your customised mode menu.

SPRITELY SPRITES

One rather mysterious module within Risc OS 3 is *DragASprite*. There is no documentation on it anywhere, and nothing much seems to use it; a couple of PD utilities and that's about it. You may be surprised to learn that just about all Risc OS 3 applications (meaning those in Rom) can be made to use it with a simple OS_Byte call. If you type: *FX 162,28,3 at the command line then enter the desktop, all save boxes will allow you to drag the actual sprite of the file around rather than a dotted box.

Filer copies by dragging still produce a dotted box unless you use the filer menu 'copy' option (which produces a save box). The FX call writes to byte 28 of Cmos Ram, and the usual contents seems to be 1, so we are merely setting bit 1 by writing a 3. *FX 162,28,1 will cancel the effect.

We think that this sprite dragging might not actually work reliably and that's why the ability to set this bit is not included within *!Configure*. But then again, perhaps someone just forgot about it . . . Anyway, we've not experienced any problems having draggable sprites and it does make the desktop look dead swish.

ONE LINE CORNER

Three monolinear ditties for you; *1LKlee* appears courtesy of Jan Vibe. It's a bit like the classic *Wiggle* from a couple of years back, but subtly isometric. *1LBall* is a masterful demonstration of compact coding, and bounces a green thing round the screen under mouse control.

Finally, and most unusually, *DaftClock*. This creates a file in the Ram disc once every second. The result is a desktop clock. (You need to open the Ram disc and view it as 'Full Info')

*QUIT

Well, don't leave us quite yet; if you turn to page 75, you will find our usual in-depth Beginners' Bit.

As usual, we'd like to stress that listings, applications, hints, tips and requests are always welcome.

All but the shortest listings should be on disc together with a description. **And please do not forget to write your name and address on all your discs.**

A stamped, self-addressed envelope will ensure the return of your disc. If you are a particularly young – or particularly old – reader, please let us know your age.

Send all your program submissions to the usual address:
***INFO, BBC Acorn User,
Redwood Publishing,
101 Bayham Street,
London NW1 0AG**

BEGINNERS' BIT

The Arc's sprite facilities can provide particularly rewarding results for novice programmers. This month we begin a set of example programs that illustrate the Arc's many sprite calls. Sprites are held in sprite areas. These consist of a short header followed by the data for each sprite. Although all sprite areas are identical in format, there is one special area called the system sprite area. Sprites may be loaded into the area with *SLoad, selected with *SChoose and plotted on the screen using PLOT. There are also many other * commands provided; type *Help SpriteUtils for a complete list.

There are serious disadvantages to using the system sprite area though. It may not be big enough for your requirements and in this case you will have to reconfigure your machine or drag a bar in the task window. The area is also 'public' and is therefore not well suited to the multi-tasking world of Risc OS. Far better to set up your own private sprite area. It can be as big as you need, will not interfere with other programs' sprite areas and the OS_SpriteOp call provides all the facilities of the sprite * commands plus many more.

One SYS call is used for all sprite operations; OS_SpriteOp. This takes as its first parameter a reason code describing the required action. Five listings – *SprDem1* to 5 – demonstrate the simpler OS_SpriteOp calls. The table in yellow pages is for reference and contains a complete list of the parameters needed for each of the OS_SpriteOp calls mentioned.

SprDem1 creates two simple sprite files. The first contains sprites called *1*, *2* and *3* and the second sprites *4*, *5* and *6*. These sprite files are called *SprFileA* and *SprFileB* and are used by the other examples, so run *SprDem1* first. First the palette is defined in the usual way. We are using a 16-colour mode (mode 9) and our sprites will have their own palettes which will be copies of the one set up by PROCpalette.

PROCinit_sprite_area sets up our own private sprite area. Each sprite area has a four word header. These words contain the size, number of sprites and two pointers. After reserving some memory you must put the size of your area at area!0 and the value 16 at area!8. Now you can use SpriteOp &09 to initialise your area. This takes one parameter – a pointer to the area in R1. All OS_SpriteOp calls need this parameter.

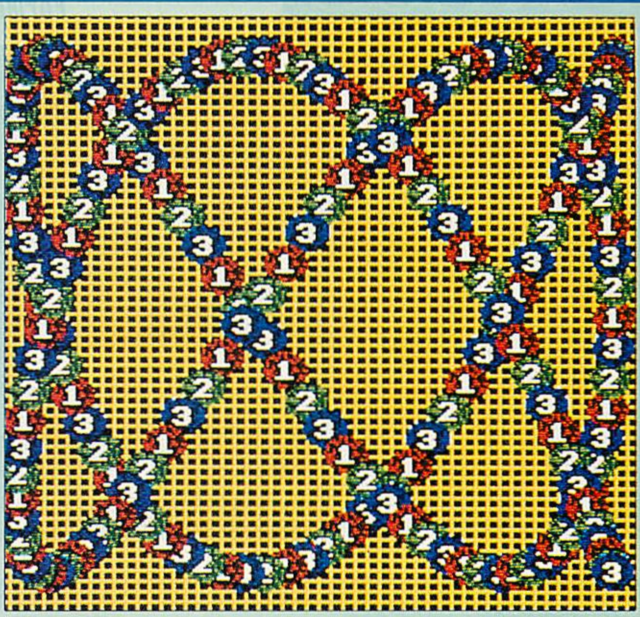
SprDem1 goes on to create some sample sprites using PROCmake_demo_sprites. These are plotted on the screen and then grabbed as sprites using sprite op &10. This call takes as its parameters the sprite area, the sprite name, a palette flag and a rectangle describing which area of the screen to grab. Palette flags are always 0 or 1. If they are set to 1, the current palette is copied to the sprite's private palette. The sample sprite files are saved by procedure PROCsave_sprites with sprite op &0C.

SprDem2 shows simple sprite plotting. PROCload_sprites loads one sprite file and merges the other into the sprite area with sprite op &0B. We could use sprite op &0A to load sprites, but since a sprite file is just a sprite area minus the initial length word, we can use OS_File 255 provided we have set the length word correctly. PROCtile fills the screen with randomly chosen sprites. The graphics cursor is moved with MOVE and then sprite op &1C is used to plot a sprite at the current cursor position. Finally PROCscreen_test saves and then reloads the finished results with sprite ops &02 and &03. These are equivalent to the *ScreenSave and *ScreenLoad commands.

In *SprDem2* and other examples, the palette is set up by reading it from one of the sprites. If you create a palette for a sprite, two words will be set aside describing the appropriate number of colours for the mode in which the sprite was defined. All our sprites are mode 9 so there are 2*4*16=128 bytes of palette data for each sprite. Two words are used for a colour because it may potentially flash between two settings. In practice, flashing colours aren't used and both values are identical. *SprDem2* makes this assumption.

The palette is found at offset 44 within the data for a particular sprite, so we must first find the sprite's actual address. PROCset_palette begins by using sprite op &18 to read the address for the sprite whose palette is to be used. Code &18 is used both to select a sprite and find its address in this way.

Now the COLOUR command is used to set the palette. Each palette word is of the form &BBGGRRXX where R=red, G=green, B=blue and XX is not used.



Value	Action	Value	Action
&0	Overwrite screen colour	&1	OR with screen colour
&2	AND with screen colour	&3	EOR with screen colour
&4	Invert screen	&5	Preserve screen colour
&6	screen AND (NOT sprite	&7	screen OR (NOT sprite)
&8-&F	as above but use mask	&10	ECF pattern 1
&20	ECF pattern 2	&30	ECF pattern 3
&40	ECF pattern 4	&50	Giant ECF pattern

Very often sprites will have masks. These are used for sprites which are not rectangular and which you need to plot on the screen without leaving a black rectangle around them. For each pixel in a sprite there is a corresponding pixel in the mask. This will have all its bits set to 1 if the pixel is to be plotted or set to 0 if the pixel is to be transparent. The screen will be left intact and unmodified under any transparent pixels.

PROCmake_masks creates masks for sprites *4*, *5* and *6* with sprite op &1D. First the width and the height of the sprite are read with op &28. The &2XX form of the sprite op is being used here. The addresses of the sprites are all stored in the array spr%() and this will speed up plotting since decoding the sprite names can take a little while.

A new mask will have all bits set so all the pixels are visible. Two loops are used to find any black pixels and the mask is cleared under these (with sprite op &2C) to make them transparent. When done, PROCmask_test is used to demonstrate plotting with and without masks. PROCpattern displays a simple background and then plots the sprites with sprite op &22.

Unlike the simpler op &1C, this takes x and y screen co-ordinates. It also takes a plot action. The most useful is 8 which simply means 'use mask'. After the pattern has been displayed once, the masks are deleted using sprite op &1E. Note that we have to find the new sprite addresses since they may be shuffled by the mask deletion.

SprDem4 displays information about a sprite area. Sprite op &08 returns the size of the area, number of sprites and offset to the first sprite. Then sprite op &0D is used to find the names of the sprites. The first sprite is numbered 1 and the call is repeated for sprites 2, 3 and so on until an error is returned meaning 'no more sprites'.

Information about each sprite is found with sprite op &28 and whether it has a palette or not can be found by looking at offset 32 into a sprite's data. This is a pointer to the sprite image itself and will be 44 if there is no palette, or more if palette data precedes the image.

The final demonstration, *SprDem5* shows how sprites can be deleted, copied, renamed and so on. PROCcat_sprites uses sprite op &0D to catalogue a sprite area. The other procedures are self-explanatory. For a full list of this month's sprite ops, see the table on the yellow pages.

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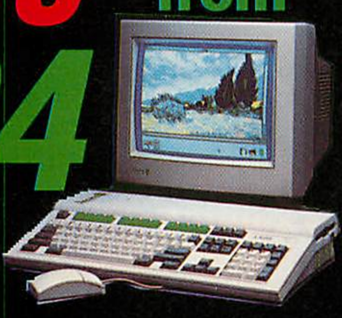
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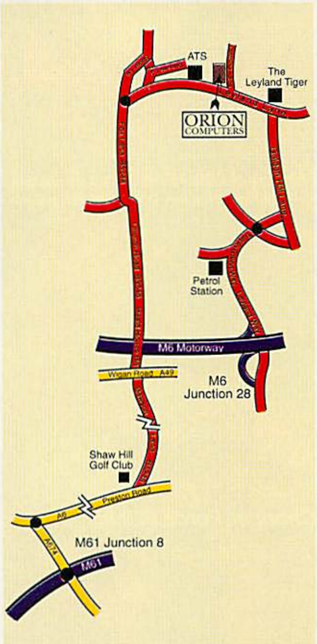
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SPACE EVADERS

Antony Bruce Lytis explains how to make your baddies dodge and dive

If you've been following our series, you should now know how to scroll a background screen full of graphics and also the principles behind blatting multi-coloured aliens all over the place.

Putting these two processes together is not, unfortunately, a simple matter of bolting together all the routines presented so far; this is real life after all. But, never fear, this month it's the low-down on how to make your baddies whizz around all over the place.

If you look at any self-respecting shoot-em-up, it will be full of aliens zooming, looping and generally having a good time of it, until you pump them full of laser-guided photon torpedoes. In last month's sprite installment you saw how easy it is to make aliens (or rocks) move in straight lines or orbits, but what about these complex jiggly paths? Well, doing this is really not as hard as it seems. If you analyse the path of an average-type alien in your favourite shoot-em-up, it will most likely be following a sequence of moves, often repeating them time and time again. All we need is a simple way of creating these movement paths. This is exactly what the program *AlienEd* does.

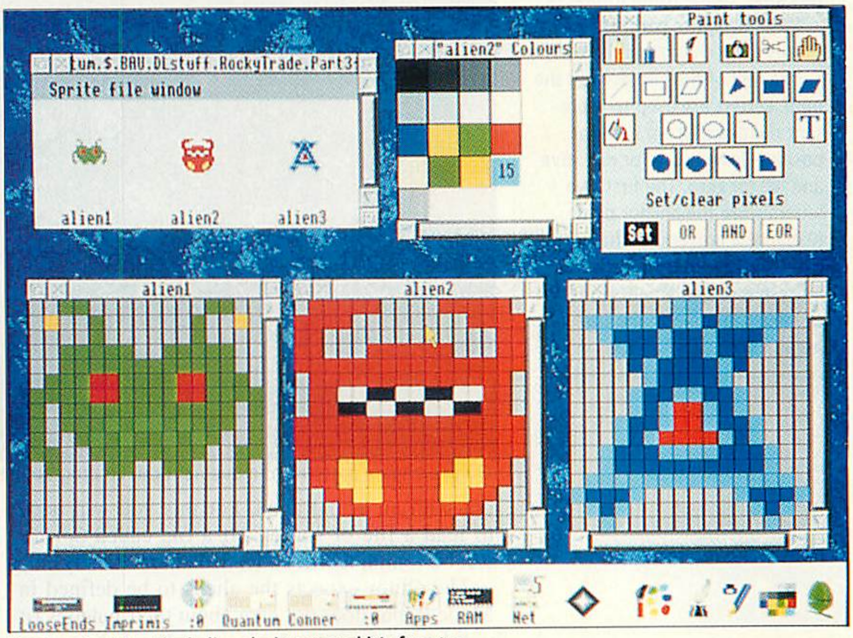
Paths are made up of a series of moves representing how far and in which direction the alien will move at that stage, much like a line object in a *Draw* file. The path 'auto-repeats' as often as necessary, meaning that the alien starts again with the first move in the path once it has finished the last.

THE EDITOR

The editor screen is divided into three main areas. The top portion is used to display the current file names for both the path and the sprite, and there is also a small menu bar. The bottom left is taken up with the designing grid and the bottom right with the 'preview' area. Unless you have already created the file called *Moves* the grid will be empty, if you have, then select a blank grid by clicking on 'Path:' with the left mouse button.

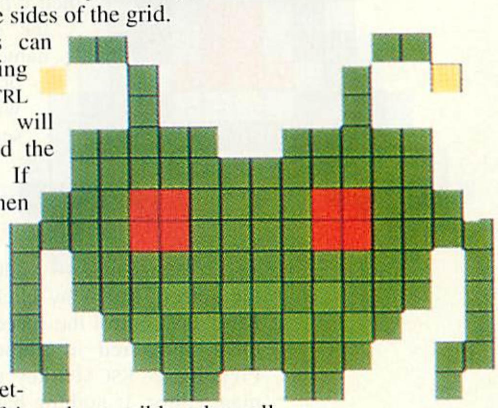
Now click somewhere on the grid. A red circle will appear, which is the anchor point for the path. Subsequent mouse clicks will be indicated by green circles connected with blue lines. These represent the steps made by the alien as it moves along the path. Obviously the further apart the steps, the quicker the alien will move, but the more jerky it will appear.

As you place points on the path, a small preview will appear to the right of the grid. This shows what the path would look like repeated five times and it is useful to gauge the general direction of movement in the path. As everything is stored as relative moves, it makes no difference where the anchor is. You are therefore free to drag it to any point on the grid.



Paint makes the ideal alien designer; and it's free too . . .

You may need to do this if you run out of space. If you are unhappy with the position of a path element you can also drag the green circles. Moving one point will move it relative to the previous point but this process also moves all subsequent points by the same degree to let you fine tune a path. You can drag a single point, without moving the others, by holding down SHIFT. Obviously, the editor prevents you from moving points off the sides of the grid.



Extraneous points can be removed by clicking on them with CTRL held down. This will delete that point and the path leading to it. If nothing happens when you try to delete a point, it means that the resulting path was too big for the grid. Moving the anchor may allow you to delete it. Deleting the anchor itself is only possible when all other points have been deleted.

If the preview path is disappearing off the screen, you can move it around by clicking anywhere in the preview area, again, as everything is stored relative, this position bears no relevance to the data stored. To get more of a feel for the path you have created you can try it

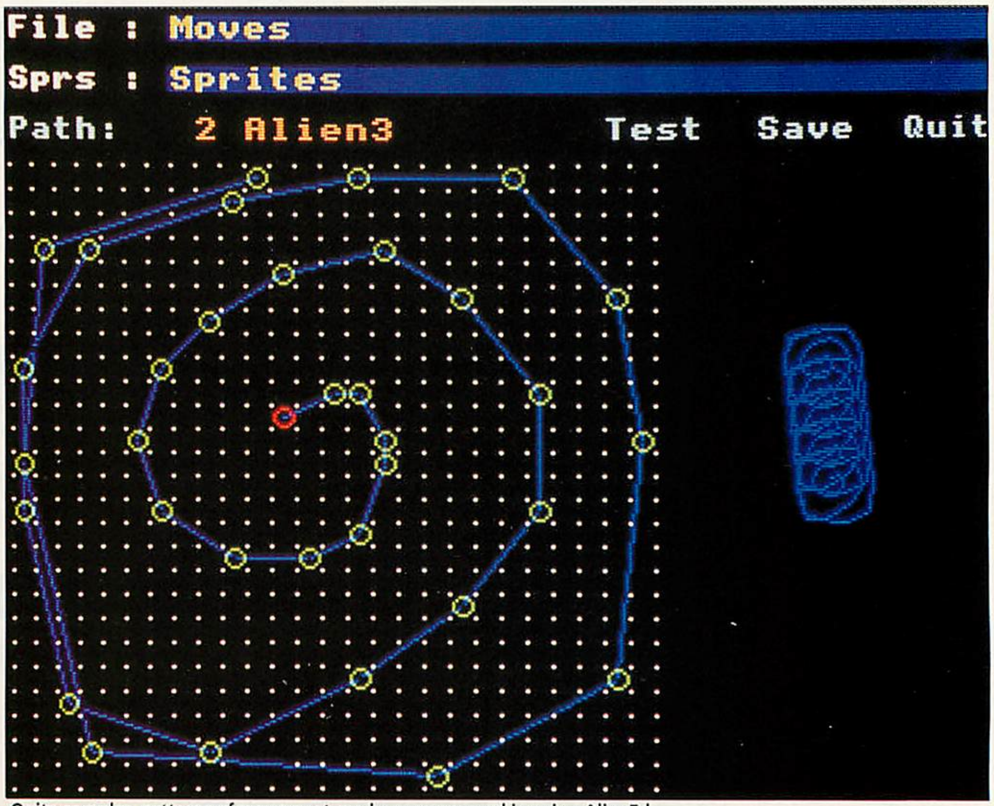
MOVE FILES

Files of moves are stored as plain text with lines terminated by Ascii 10. Blank lines are ignored, lines beginning with a ';' are comments and also ignored.

A path is made up of two 'fields'. The first 14 characters contain the sprite name associated with the path (if any). Sprite names can be up 12 characters long, so the usual format is:

[SPACE] {sprite padded with spaces to 12 characters} [SPACE]

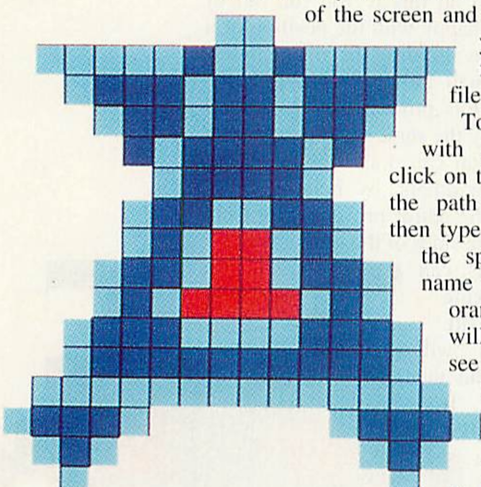
The rest of the line defines the path. Letters are used to represent numbers, upper case for positive, lower case for negative and '@' for zero. The first two letters store the anchor point (0,0) in the bottom left hand corner. Subsequent letter pairs represent path elements in terms of moves relative to the current point.



Quite complex patterns of movement can be programmed in using AlienEd

out with an actual alien. For this you will need to load a file of sprites. (If a file called *Sprites* can be found, it will be loaded automatically).

The editor expects the aliens to be defined in Mode 9, but does not care about their palettes (it will be set accordingly) or size; large aliens just might move a little slowly, as we are not using any cunning sprite plot routines. To load a sprite file, click anywhere on the 'Sprs:' line at the top of the screen and type in the name of your file, if it can be found. If it is a sprite file it will be loaded.



To associate a sprite with a movement path, click on the " " to the right of the path number. You can then type in a sprite name. If the sprite is present, the name will be displayed in orange, if it is not, it will be shown in red. To see the result click on Test. Your alien should dance merrily about.

You can reposition the alien – if it goes off the screen, say – by clicking with the mouse. Keys 1-9 control the speed of the alien's movement, measured in frames (1 is the fastest). Pressing the ESCAPE key will return you to the main editor. If nothing happens when you click on Test, it either means there is no definition for the current path, or there is no sprite associated with the path that can be found in the current sprite file.

Back in the editor, clicking on the path number with the left or right mouse buttons selects another path to edit. *AlienEd* can cope with up to 100 paths at once, but this can easily be increased if needed. Each of the paths can be associated with any of the sprite names, which allows you to try out different movement types for the same alien.

To save a file of moves, click on 'Save', modify the name as necessary and press RETURN. Only those paths that have been defined will be saved, so if you define paths 0,1 and 3, save the file and then load it back, you will have paths 0,1 and 2. The listing *Moves* on the yellow pages shows some example paths and this article illustrates some fierce aliens that you might like to try out.

ALIEN MOTION

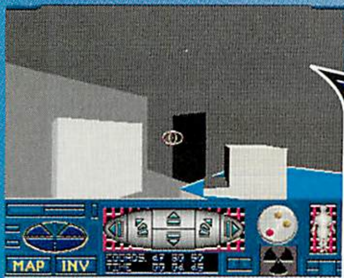
To get more of an 'atmospheric' taste of your movement patterns, try running *AlienMove*. This loads the *Moves* and *Sprites* files and animates a number of sprites. Each one will follow its path for a random number of repeats before being 'liquidated'. Any alien wandering too far off the screen will also be in for the chop. Although you can't shoot them yet, I hope this demonstrates how a very simple technique can be used to great effect.

We will be using defined alien paths in the final game, but any self-respecting shoot-em-up also needs to include aliens that use more than one path and aliens that use special paths that do things like home in on your ship. We will also need to include data such as how often an alien moves and if and when it fires.

Although none of these features are catered for at the moment, the next sprite-splitting installment will concentrate on giving our hostile xenomorphs a little basic intelligence and aggression. At last, your first home-grown shoot-em-up is in sight . . . don't miss it!

A Fast Moving, Futuristic 3D Adventure!

IXION





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Acorn Computing, Jan 1993

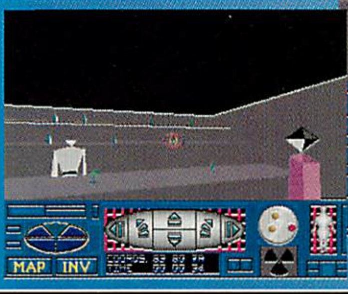
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Archimedes World, Jan 1993

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Sam Greenhill, Acorn User, Feb 1993







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A s you can see from the stack examples from the last couple of months, LDM and STM are very efficient ways of moving data around an Arm-based machine. In a couple of 32-bit instructions, it is possible to move 52 bytes, pulling 13 registers off one stack and pushing them on to another.

These instructions are therefore very commonly found in routines such as block moves, sprite plotting and array addressing. In these situations the stack 'model' of full/empty, ascending/descending is a little unwieldy, so the 'other way' of describing stack is used. Say R10 was pointing to a block of data that you wanted loaded into R0 to R4, the most sensible notation to use would be:

```
LDMIA R10,{R0-R4}
```

Translating this into English, the registers are loaded starting from the address stored in R10, but this is Incremented After each load; hence the IA. Then, if you want to store them at R11, you could use

```
STMIA R11,{R0-R4}
```

As each stacking notation has an equivalent in this notation, can you guess what the other three forms are? Give yourself a small pat on the back if you thought of IB, DA and DB. If you didn't guess these, can you guess why they are there?

Descending and Ascending have replaced by Decrement and Increment and Full and Empty by Before and After, although there has not been a simple substitution. It is true that LDMFD is exactly equivalent to LDMIA, but STMFD is actually the same as STMDB. Pushing and pulling data can't really access the data in the same direction each time. Which of the four methods you choose obviously depends on the way in which your data is stored. If you think back to single data transfers, there are very easy analogies:

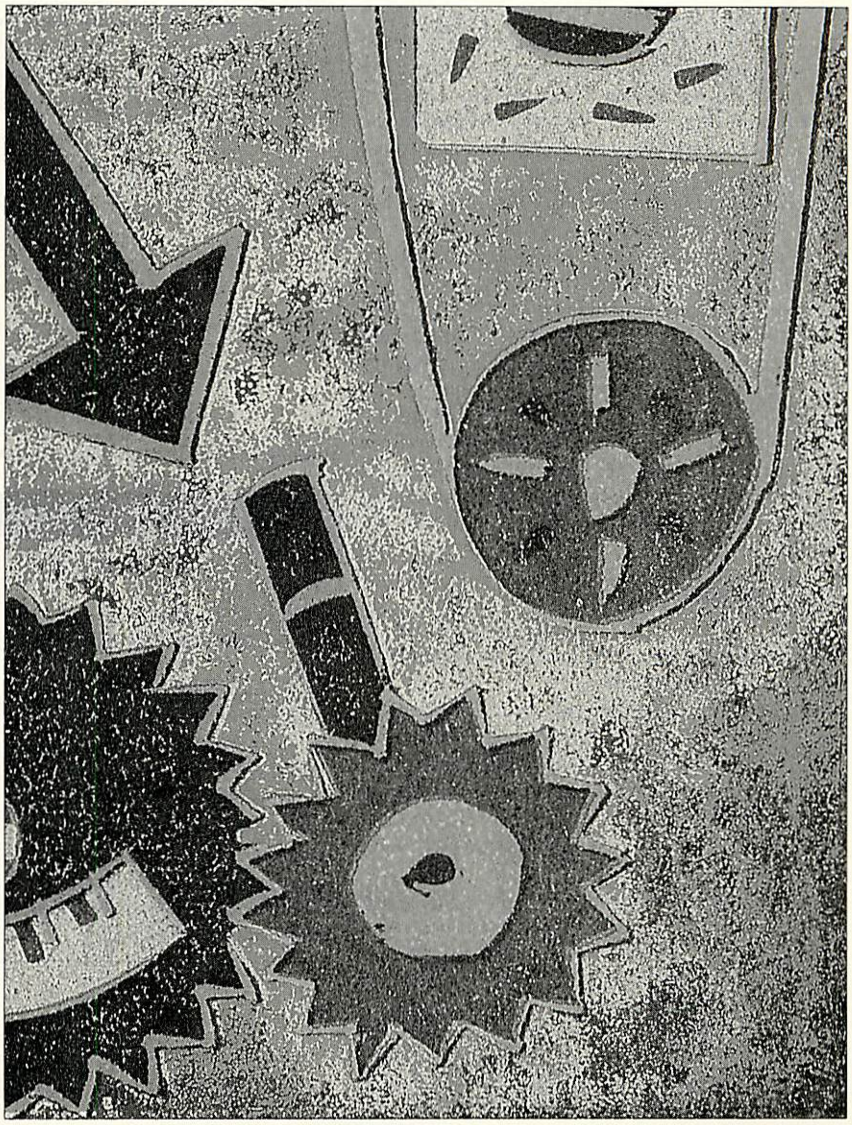
```
LDMIA – LDR a,[b],#4
LDMIB – LDR a,[b,#4]!
LDMDA – LDR a,[b],#-4
LDMDB – LDR a,[b,#-4]
```

The difference in this case is that you can keep on loading as many registers as you like in the same way.

MOVING PICTURES

Time for a demonstration. *Arm1* scrolls some dots up the screen; amazing . . . The little Basic loop at the end WAITs for the next frame sync – to ensure smooth movement – then plots a random point on the screen. The piece of code at .scroll is then called to scroll the screen, so let's take a look at how it works. (By the way, the 'magic' SYS call just before the loop simply reads the address of the first byte of screen memory.)

The scrolling starts by initialising two pointers; write is set to the top left and corner of the screen and read 80 bytes further on. This demo runs in Mode 0, which has 640 pixels across the screen. As it is a monochrome mode, one bit per pixel is needed to store the screen data. There are therefore 640/8 bytes on a line, and so read points to the first byte on line two: lines is loaded with 256, the number of pixel lines on the screen. The actual scrolling is performed by the next four instructions; each LDM/STM pair moves 10 registers (R0-R9) from pointer read to pointer write.



PAUL SCHOFIELD

ASSEMBLY LINE

Dave Lawrence explains more about Arm programming



Ten registers is equal to 10 32-bit words, which equals 10 lots of four bytes or 40 bytes for each move. So two LDM/STMs are needed to move the 80 bytes on each line. Note that write back is being used (the '!' tells you this) to update the values of read and write ready for the next transfer; lines is decremented after each line is moved, and control returns to Basic when this reaches zero and the whole screen is scrolled.

If you do your maths, you'll notice that the last line transferred actually comes from off the bottom of the screen. This is a little bit naughty, but selecting Mode 8 before Mode 0 will ensure that this memory is zeroed. As an exercise, try amending the program so this bodge is not needed. How could you make the scroll go the other way? How about making it scroll two lines at a time? Or three? Or any? What would you have to do to make this code work in Mode 12, or indeed, any mode? No prizes I'm afraid, but it's all good practice.

TIME WARP

'. . . this may free up a valuable register. We'll meet an exceptionally neat way of coding this method two a little later on.'

You should remember this from last December. If not, go back and refresh your memory. It was in reference to multi-dimensional arrays and how to get access to the elements. As we're now onto multiple loads and stores you can probably think of a good way of storing and accessing large arrays.

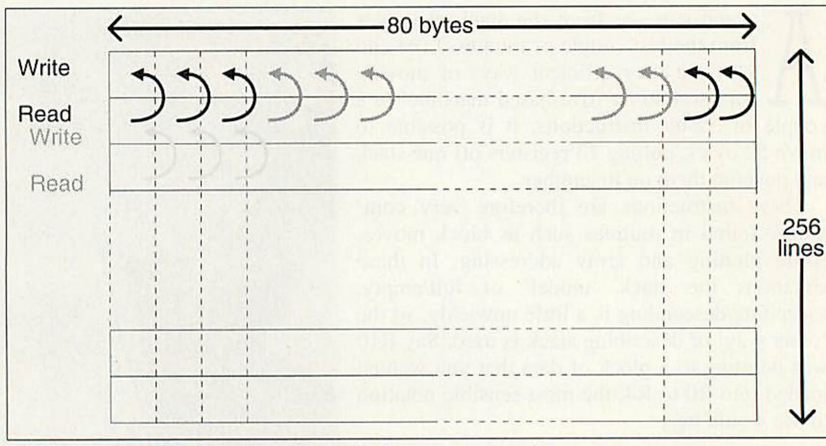
Arm2 is a fairly complex example that illustrates both sorts of LDM. The purpose of it is to find distances between pairs of co-ordinates. The procedure PROCsetup creates 10 random sets of data and stores them consecutively starting at .data. Space for one 32-bit word is left after each set of data to hold the result. After the code has been called, PROCresults is used to display the input data, the calculated result and, as a check, a value calculated by Basic.

The code enters at .calc, with R0 containing the number of calculations to perform. Since we are going to call a subroutine, the value of link is stacked, so that we can get back to Basic at the end. R0 is transferred to R9 for safe keeping and R10 is set to point to the first set of data. The code after loop performs the actual calculation.

The LDMIA instruction loads the next four words into R0 and R3. These will be x_1, y_1, x_2, y_2. R10 is updated with write-back, and will now point to the spare word, where the answer will be stored. We now need to perform the calculation:

$$SQR\ (\ (x_2 - x_1)^2 + (y_2 - y_1)^2\ )$$

The next five instructions do this. The box (above right) explains them in more detail. The result is stored at R10 which is then updated. STMIA R10!,{R0} is used here, because it fits in with LDMIA above. If you wanted, it would be quite all right to use STM R0,[R10],#4. The effect is exactly the same. The loop is executed R9 times to process all the data, and then control returns to Basic and the results are printed. Unless you've typed the program in wrong, you should find that the calculations are the same as those from Basic.



Scrolling a screen the fast way; using multiple move commands

INSIDE ARM2

SUB R2,R2,R0: calculate difference in x
MUL R0,R2,R2: square it
SUB R3,R2,R1: calculate difference in y
MLA R0,R3,R3,R0: square it and add in dx
BL sqr: A handy square root routine I had lying around. You don't need to know how this works, although you may like to keep it for use in your own programs. It gives the square root of R0, returning the nearest integer. It is equivalent to INT(SQR(x) + 1/2) in Basic.

As I mentioned last month, despite having so many forms of describing multiple data transfers, you'll probably really only encounter two. These are FD and IA. I'm not saying you won't see the others, it's just that they are not nearly as widespread.

One commonly asked question is: 'in what order are the registers stored in a multiple store?' The answer is quite simple and always the same; ascending order in memory. So R0 will be stored at a lower address than R1 and so on. The order in which you specify the register has no relevance, and you can't reverse the order of registers by doing this:

```
LDMIA R10!,{R0-R9}
STMDB R10!,{R9-R0}
```

WHAT IS IT ALL FOR?

For a start, there are no commands in Basic that correspond to LDM and STM. When you start writing Arm code, you'll soon get into the habit of stacking and unstacking variables and return addresses, something you get 'for free' in Basic. As for data transfers, I think you'll come across all sorts of applications where these multiple movements come in handy.

There is one last, but very important, advantage in using multiple transfers and that is that they are very quick. A STM of a single register takes exactly the same time as a STR. But each additional register takes only half the time. So STMming two registers takes 75 percent of the time to STR them. For 10 registers we're looking at a procedure that runs at nearly twice the speed. The difference in loading is even more dramatic, as each extra register take only a quarter of the time, so two registers take 62.5 percent of the time and 10 less than a third. If you translate this into single byte transfers, the screen scroll routine Arm2 would run over twelve times slower if we replaced the LDM/STMs with LDRB and STRBs.

When writing block moving routines, for example: sprite plotting; screen scrolling; or even DMA routines, it is always worth the extra hassle of using LDM and STM as much as possible; just take a look at the landscape scroll routines from the games design article in the January issue to see the difference that these can make. Next month, we will be looking at some useful subroutines and how to implement recursion.

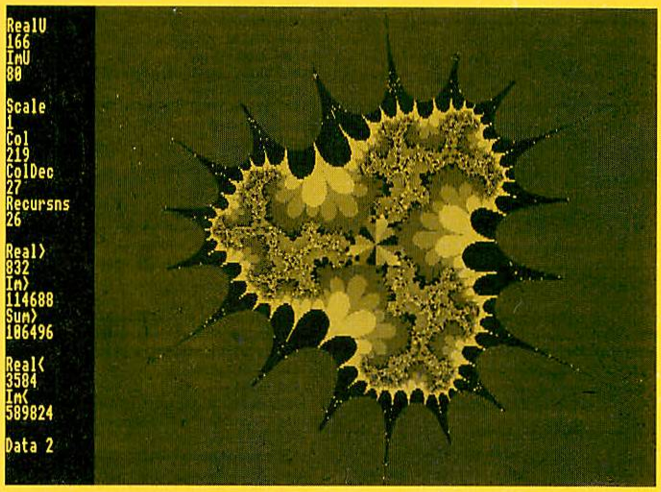
YELLOW PAGES

Free programs for you to type in and use

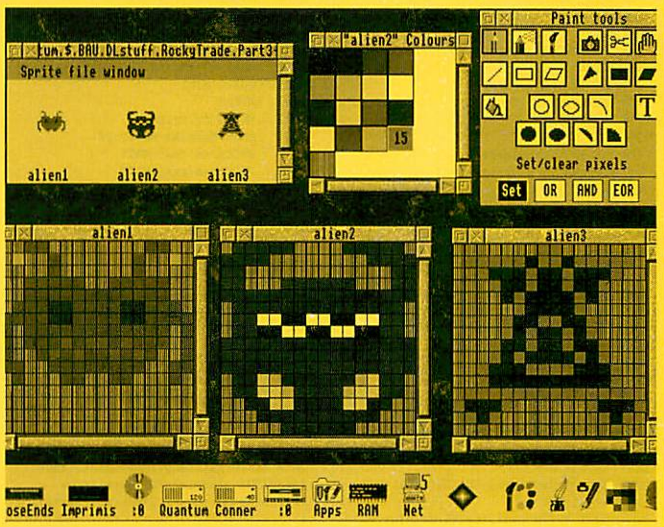
COMPATIBILITY CHART

Use this chart to check if a program will work on your machine. There are two columns, one for eight-bit machines like the Model B and Master 128, and one for 32-bit machines, like the A3000, A400 or A3010. If there is a star for the program in the column then it will work on your machine. Special exceptions and hardware requirements are listed as foot notes at the end of the table.

Article	Program Name	8-bit	32-bit
Heavy Stuff			
Grav1	FieldLines		*
Grav2	Gravity		*
Grav3	MutualAtt		*
***INFO**			
Info1	BiomorColD		*
Info2	Bells	*	*
Info3	MethPRT	*	*
Info4	PolyPat		*
Info5	ShadeStar		*
Info6	DTWelcomeS		*
Info7	1LKlee		*
Info8	1LBall		*
Info9	DaftClock		*
Info10	SprDem1		*
Info11	SprDem2		*
Info12	SprDem3		*
Info13	SprDem4		*
Info14	SprDem5		*
GameDes			
GameDes1	AlienED		*
GameDes2	AlienMove		*
GamesDes3	Moves		*
Assembly Line			
ArmProg1	Armprog1		*
ArmProg2	Armprog2		*



Morph your Bios with BioMorph



Design and move your own aliens

HEAVY STUFF

Listing 1

```
   10 REM >FieldLines (Grav1)
   20 REM By Mathew Tizard
   30 REM Illustration of the nature of
gravity
   40 REM 32-bit machines
   50 REM (c) BAU March 1993
   60 :
   70 MODE0:OFF
   80 GCOL4,0
   90 A=1:B=2:Y=4
  100 REPEAT Y=Y*1.09
  110 CIRCLE FILL 640,500-Y,200+Y
  120 FOR N=-1 TO 3 STEP 0.16
  130 LINE 640,500-Y,SINRADN*Y*2,COSRADN
*Y*2
  140 NEXT
  150 SYS 6,112,A
  160 SYS 6,113,B
  170 WAIT
  180 CLS
  190 SWAP A,B
  200 UNTIL Y>15500
  210 RUN
```

Listing 2

```
   10 REM >Gravity
   20 REM By Mathew Tizard
   30 REM Tidied up by Dave Lawrence
   40 REM For all 32-bit machines
   50 REM (C) BAU March 1993
   60 :
   70 *KEY1 01|M1|M199|MB8|MN
   80 ONERROR MODE12:REPORT:PRINT" at li
ne ";ERL:END
   90 :
  100 MODE12:OFF
  110 *FX10
  120 PROCinit
  130 IF demo THEN null=FNdemosetup(demo
):CLS:COLOUR1,6:GOTO190
  140 PROCgrid
  150 *POINTER 1
  160 IF heavies PROCfix_heavies
  170 PROCfix_clusters
  180 PROCbounding_box
  190 PROCselect_animation
  200 PROCinitial_state
  210 PROCgravitate
  220 PROCanimate
  230 END
  240 :
  250 DEF PROCinit
  260 COLOUR 6
  270 PRINT'STRING$(24," ");"Simulation
Of Newtonian Gravity."
  280 demo      =FNget("Demo 1-5 or 0 to
 design...","012345")
  290 IF demo THEN null=FNdemoinit(demo)
:GOTO 370
  300 VDU 11,11
  310 heavies   =FNinput("How many Heavy
 masses? (0-20)",0,20)
  320 clusters  =FNinput("How many Clust
ers of particles? (1-20)",1,20)
  330 particles =FNinput("How many parti
cles per Cluster? (1-10000)",1,10000)
  340 style     =FNget("Plot as points,
blurs or circles? (P/B/C)","PBC")
  350 mode      =FNinput("Screen mode? [
1,8,19 suggested]",1,127)
  360 bounce    =(FNget("Bounce off side
s of bounding box? (Y/N)","YN")=0)
  370 DIM hx(heavies),hy(heavies),htype(
heavies)
  380 DIM type(clusters)
  390 DIM x(clusters,particles),y(cluste
rs,particles),xv(clusters,particles),yv(
clusters,particles)
  400 DIM xc(clusters),yc(clusters)
  410 DIM Amin(clusters),Amax(clusters),
Rmin(clusters),Rmax(clusters)
  420 DIM Dmin(clusters),Dmax(clusters),
Vmin(clusters),Vmax(clusters)
  430 damping=0.5
  440 G%=1E4
  450 VF=20
```

```
460 space=HIMEM-END-16384
470 DIM memory space
480 clear$=CHR$30+STRING$(80," ")+CHR$30
490 radial=heavies+1
500 xlo=0:ylo=0:xhi=1279:yhi=959
510 SYS "OS_SWINumberFromString",,"XOS_SpriteOp" TO spop
520 ENDPROC
530 :
540 DEF PROCgrid
550 CLS
560 COLOUR 6
570 COLOUR 14,100,100,100
580 GCOL 14
590 FOR Y=0 TO 960 STEP 64
600 MOVE -2,Y
610 PLOT 21,1280,Y
620 NEXT
630 FOR X=0 TO 1280 STEP 63.9
640 LINE X,0,X,960
650 NEXT
660 ENDPROC
670 :
680 DEF PROCfix_heavies
690 MOUSE RECTANGLE 0,0,1279,960
700 FOR h=1 TO heavies
710  PROCfix_centre("Heavy "+STR$h+" (Select=Attractive,Adjust=Repulsive)",hx(h),hy(h),12,1)
720  htype(h)=SGN(2-mz)
730  IF htype(h)=1 THEN GCOL 0:CIRCLE FILL hx(h),hy(h),8
740 NEXT
750 ENDPROC
760 :
770 DEF PROCfix_centre(of$,RETURN cx,RETURN cy,rad,gcol)
780 PRINT clear$;"Fix centre of ";of$;
790 PROCget_mouse(cx,cy)
800 GCOL gcol
810 CIRCLE FILL cx,cy,rad
820 PROCrelease
830 ENDPROC
840 :
850 DEF PROCget_mouse(RETURN mx,RETURN my)
860 REPEAT
870  MOUSE mx,my,mz
880 UNTIL mz<>0
890 ENDPROC
900 :
910 DEF PROCrelease
920 REPEAT
930  MOUSE rmx,rmy,rmz
940 UNTIL rmz=0
950 ENDPROC
960 :
970 DEF PROCfix_clusters
980 FOR c=1 TO clusters
990  PROCfix_centre("Cluster "+STR$c,xc(c),yc(c),4,3)
1000  null$=FNfix_radii("radii of Cluster "+STR$c+" (Select=Positive,Adjust=Negative)",Rmin(c),Rmax(c),xc(c),yc(c),3,"")
1010  CASE FNfix_angles("arms of Cluster "+STR$c+" (Full)",Amin(c),Amax(c),xc(c),yc(c),Rmin(c),Rmax(c),3,"F") OF
1020  WHEN "F":
1030    Amin(c)=0
1040    Amax(c)=360
1050  ENDCASE
1060  text$="velocity radii of Cluster "+STR$c+" (Select=Positive,Adjust=Negative) (Still)"
1070  keys$="S"
1080  IF heavies text$=LEFT$(text$)+"/Orbit)":keys$+="O"
1090  CASE FNfix_radii(text$,Vmin(c),Vmax(c),xc(c),yc(c),4,keys$) OF
1100  WHEN "O":
1110    type(c)=FNget_orbit(xc(c),yc(c))
1120  WHEN "S":
1130    Vmin(c)=0
1140    Vmax(c)=0
1150  OTHERWISE:
1160    CASE FNfix_angles("motion angles of Cluster "+STR$c+" (Radial/Full)",Dmin(c),Dmax(c),xc(c),yc(c),Vmin(c),Vmax(c),4,"RF") OF
1170      WHEN "F":
1180        Dmin(c)=0
1190        Dmax(c)=360
1200      WHEN "R":
1210        type(c)=radial
1220        FOR a=0 TO 359 STEP 20
1230          MOVE xc(c),yc(c):DRAW BY Vmax(c)*0.2*SINRAD(a),Vmax(c)*0.2*COSRAD(a)
1240        NEXT
1250    ENDCASE
1260  ENDCASE
1270 NEXT
1280 Vmin()=Vmin()/VF
1290 Vmax()=Vmax()/VF
1300 ENDPROC
1310 :
1320 DEF FNfix_radii(of$,RETURN min,RETURN max,x0,y0,gcol,keys$)
1330 key$=""
1340 PRINT clear$;"Fix ";of$;
1350 min=FNget_circle(x0,y0,gcol)
1360 IF key$="" THEN
1370  CIRCLE x0,y0,ABS min
1380  max=FNget_circle(x0,y0,gcol)
1390  IF key$="" CIRCLE x0,y0,ABS max ELSE CIRCLE x0,y0,ABS min
1400 ENDIF
1410 IF min>max SWAP min,max
1420 =key$
1430 :
1440 DEF FNget_circle(xc,yc,gcol)
1450 GCOL 3,gcol
1460 REPEAT
1470  MOUSE mx,my,mz
1480  r=SQR((mx-x0)^2+(my-y0)^2)
1490  CIRCLE x0,y0,r
1500  WAIT
1510  CIRCLE x0,y0,r
1520  WAIT
1530  key$=FNkey
1540 UNTIL mz<>0 OR key$<>""
1550 PROCrelease
1560 IF mz AND 1 r=-r:COLOUR 0,7:WAIT:WAIT:COLOUR 0,0
1570 =r
1580 :
1590 DEF FNkey
1600 k$=INKEY$0
1610 IF k$="" THEN =""
1620 IF k$>="a" AND k$<="z" k$=CHR$(ASC k$-32)
1630 IF INSTR(keys$,k$) THEN =k$
1640 =""
1650 :
1660 DEF FNfix_angles(of$,RETURN min,RETURN max,x0,y0,rmin,rmax,gcol,keys$)
1670 PRINT clear$;"Fix ";of$;
1680 GCOL 3,gcol
1690 REPEAT
1700  MOUSE mx,my,mz
1710  min=FNatn(mx-x0,my-y0)
1720  PROCarm(min):WAIT
1730  PROCarm(min):WAIT
1740  key$=FNkey
1750 UNTIL mz<>0 OR key$<>""
1760 PROCrelease
1770 IF key$="" THEN
1780  CIRCLE x0,y0,ABSrmin
1790  CIRCLE x0,y0,ABSrmax
1800  xmin1=x0+rmin*SINRAD(min):ymin1=y0+rmin*COSRAD(min)
1810  xmax1=x0+rmax*SINRAD(min):ymax1=y0+rmax*COSRAD(min)
1820  REPEAT
1830   MOUSE mx,my,mz
1840   max=FNatn(mx-x0,my-y0)
1850   PROCarea(max):WAIT
1860   PROCarea(max):WAIT
1870   key$=FNkey
1880  UNTIL mz<>0 OR key$<>""
1890  PROCrelease
1900  GCOL 0,gcol
1910  IF key$="" THEN
1920   PROCarea(max)
1930  ELSE
1940   CIRCLE x0,y0,ABSrmin
1950   CIRCLE x0,y0,ABSrmax
1960  ENDIF
1970 ENDIF
1980 SWAP min,max
1990 IF min>max max+=360
2000 =key$
2010 :
2020 DEF PROCarm(ang)
2030 sin=SINRAD(ang):cos=COSRAD(ang)
2040 MOVE x0+rmin*sin,y0+rmin*cos
2050 DRAW x0+rmax*1.2*sin,y0+rmax*1.2*cos
2060 DRAW BY -rmax*0.2*cos,rmax*0.2*sin
2070 PLOT 153,4,0
2080 ENDPROC
2090 :
2100 DEF PROCarea(ang)
2110 xmin2=x0+rmin*SINRAD(ang):ymin2=y0+rmin*COSRAD(ang)
2120 xmax2=x0+rmax*SINRAD(ang):ymax2=y0+rmax*COSRAD(ang)
2130 MOVE x0,y0:MOVE xmin1,ymin1:PLOT &A5,xmin2,ymin2:DRAW xmax2,ymax2
2140 LINE xmin1,ymin1,xmax1,ymax1:MOVE x0,y0:MOVE xmax1,ymax1:PLOT &A5,xmax2,ymax2
2150 ENDPROC
2160 :
2170 DEF FNget_orbit(x0,y0)
2180 PRINT clear$;"Click on a Heavy to orbit around (Select=Clockwise,Adjust=Anticlockwise)."
2190 REPEAT
2200  MOUSE mx,my,mz
2210  h=heavies+1
2220  REPEAT
2230   h-=1
2240   d=SQR((mx-hx(h))^2+(my-hy(h))^2)
2250  UNTIL h=1 OR d<12
2260  LINE x0,y0,mx,my
2270  IF d<12 CIRCLE FILL hx(h),hy(h),12
2280  WAIT
2290  LINE x0,y0,mx,my
2300  IF d<12 CIRCLE FILL hx(h),hy(h),12
2310  WAIT
2320 UNTIL mz<>0 AND d<12
2330 PROCrelease
2340 GCOL 4
2350 LINE hx(h),hy(h),x0,y0
2360 d=SQR((x0-hx(h))^2+(y0-hy(h))^2)
2370 IF mz AND 1 dir=-1 ELSE dir=1
2380 IF d>50 THEN
2390  ang=FNatn(x0-hx(h),y0-hy(h))
2400  DRAW BY d/4*SINRAD(ang+90*dir),d/4*COSRAD(ang+90*dir)
2410  PLOT 153,4,0
2420 ELSE
2430  VDU 5
2440  MOVE x0-40,y0-20
2450  PRINT"Orbit:";
2460  IF dir<0 PRINT"A"; ELSE PRINT"C";
2470  VDU 4
2480  OFF
2490 ENDIF
2500 =h*dir
2510 :
2520 DEF PROCbounding_box
2530 PRINT clear$;"Adjust bounding box as necessary (Adjust to exit).";
2540 GCOL 3,6
2550 corner=0
2560 REPEAT
2570  PROCbox
2580  REPEAT
2590   REPEAT
2600    MOUSE mx,my,mz
2610    IF mz=0 corner=0
2620   UNTIL mz<>0
2630   IF mz AND 4 THEN
2640    IF corner=0 corner=FNcorner
2650    CASE corner OF
2660     WHEN 1:PROCbox:xlo=mx:ylo=my
2670     WHEN 2:PROCbox:xlo=mx:yhi=my
2680     WHEN 3:PROCbox:xhi=mx:ylo=my
2690     WHEN 4:PROCbox:xhi=mx:yhi=my
2700    ENDCASE
2710   ENDIF
2720  UNTIL corner<>0 OR (mz AND 1)
2730 UNTIL (mz AND 1)
2740 PROCbox
2750 ENDPROC
2760 :
2770 DEF PROCbox
2780 WAIT
2790 RECTANGLE xlo,ylo,xhi-xlo,yhi-ylo
2800 ENDPROC
2810 :
2820 DEF FNcorner
2830 dxlo=ABS(mx-xlo):dxhi=ABS(mx-xhi)
2840 dylo=ABS(my-ylo):dyhi=ABS(my-yhi)
2850 IF dxlo<8 AND dylo<8 THEN=1
2860 IF dxlo<8 AND dyhi<8 THEN=2
2870 IF dxhi<8 AND dylo<8 THEN=3
2880 IF dxhi<8 AND dyhi<8 THEN=4
2890 =0
2900 :
2910 DEF PROCselect_animation
2920 SYS "OS_ReadModeVariable",mode,4 TO ,,xeig
2930 SYS "OS_ReadModeVariable",mode,5 TO ,,yeig
2940 width=((xhi-xlo+1) DIV 2^xeig)
2950 height=((yhi-ylo+1) DIV 2^yeig)
2960 !memory=space
2970 memory!8=16
2980 SYS spop,&109,memory
2990 SYS spop,&108,memory TO ,,,,,zero
3000 SYS spop,&10F,memory,"Box",0,width,height,mode TO ;flag
3010 IF flag AND 1 THEN
3020  maxsprs=0
3030 ELSE
3040  SYS spop,&108,memory TO ,,,,,one
3050  SYS spop,&109,memory
3060  sprsize=one-zero
3070  maxsprs=space DIV sprsize
3080 ENDIF
3090 IF demo anim=1:maxframes=maxsprs:ENDPROC
3100 IF style=0 uses=6 ELSE uses=12
3110 vdusize=(uses*particles+3)*clusters+heavies*(3+6*2)+1
3120 maxvdus=space DIV (vdusize+4)
3130 IF maxsprs=0 AND maxvdus=0 text$="Not enough memory for animation":anim=0
3140 IF maxsprs>0 AND maxvdus=0 text$="Room for "+STR$maxsprs+" sprites":anim=1
3150 IF maxsprs=0 AND maxvdus>0 text$="Room for "+STR$maxvdus+" VDUs":anim=2
3160 IF maxsprs>0 AND maxvdus>0 text$="Room for "+STR$maxsprs+" sprites or "+STR$maxvdus+" VDUs"
3170 PRINT clear$;text$;
3180 IF maxsprs>0 AND maxvdus>0 THEN
3190  PRINT" - (S)prites or (V)DUs? ";
3200  REPEATanim=INSTR(" SsVv",GET$)DIV 2:UNTIL anim>0
3210 ELSE
3220  PRINT" - Any key to start"
3230  PROCrelease
3240  REPEAT
3250   MOUSE mx,my,mz
3260  UNTIL mz<>0 OR INKEY0<>-1
3270 ENDIF
3280 CASE anim OF
3290 WHEN 1 : maxframes=maxsprs
3300 WHEN 2 : maxframes=maxvdus
3310 ENDCASE
3320 PROCbox
3330 ENDPROC
3340 :
3350 DEF PROCinitial_state
3360 PRINT clear$;"Setting up initial state..."
3370 FOR c=1 TO clusters
3380  h=ABStype(c)
3390  IF h<radial hx=hx(h):hy=hy(h):hd=SGNtype(c)
3400  FOR p=1 TO particles
3410   ang=Amin(c)+FNrnd(Amax(c)-Amin(c))
3420   rad=Rmin(c)+FNrnd(Rmax(c)-Rmin(c))
3430   x(c,p)=xc(c)+rad*SINRADang
3440   y(c,p)=yc(c)+rad*COSRADang
3450   CASE type(c) OF
3460    WHEN 0:
3470     vel=Vmin(c)+FNrnd(Vmax(c)-Vmin(c))
3480     ang=Dmin(c)+FNrnd(Dmax(c)-Dmin(c))
3490    WHEN radial:
3500     vel=Vmin(c)+FNrnd(Vmax(c)-Vmin(c))
3510     ang=ang
3520    OTHERWISE:
3530     dx=x(c,p)-hx
3540     dy=y(c,p)-hy
3550     ang=FNatn(dx,dy)
3560     dis=SQR(dx*dx+dy*dy)
3570     vel=SQR(G%/dis)
3580     ang=ang+90*hd
3590   ENDCASE
3600   xv(c,p)=vel*SINRADang
3610   yv(c,p)=vel*COSRADang
3620  NEXT
3630 NEXT
3640 ENDPROC
3650 :
3660 DEF FNrnd(z)
3670 =RND(1)*ABSz
3680 :
3690 DEF PROCgravitate
3700 MODE mode:OFF
3710 COLOUR 1,1:COLOUR 2,2:COLOUR 3,4
3720 frames=0
3730 addrs=memory
3740 store=memory+maxframes*4
3750 full=FALSE
3760 REPEAT
3770  start=store
3780  PROCdraw_screen
3790  CASE anim OF
3800   WHEN 1:
3810    SYS spop,&110,memory,STR$frames,0,xlo,ylo,xhi,yhi TO ;flag
3820    IF flag AND 1 full=TRUE ELSE SYS spop,&136,memory,STR$frames
3830   WHEN 2:!addrs=start:addrs+=4
3840  ENDCASE
3850  PRINT;frames+1;"/";maxframes
3860  PROCcalculate
3870  frames+=1
3880  MOUSE mx,my,mz
3890 UNTIL frames>=maxframes OR INKEY0<>-1 OR mz<>0 OR full
3900 IF full frames-=1
3910 ENDPROC
3920 :
3930 DEF PROCdraw_screen
3940 PROCcls
3950 IF heavies THEN
3960  FOR h=1 TO heavies
3970   PROCgcol(RND(3))
3980   PROCcircle(hx(h),hy(h),12)
3990   IF htype(h)=1 THEN PROCgcol(0):PROCcircle(hx(h),hy(h),8)
4000  NEXT
4010 ENDIF
4020 FOR c=1 TO clusters
4030  PROCgcol(1+(c MOD 3))
4040  FOR p=1 TO particles
4050   CASE style OF
4060    WHEN 0: PROCplot(69,x(c,p),y(c,p))
4070    WHEN 1: PROCplot (4,x(c,p),y(c,p)) :PROCplot(1,xv(c,p),yv(c,p))
4080    WHEN 2: PROCcircle (x(c,p),y(c,p),4)
4090   ENDCASE
4100   x(c,p)+=xv(c,p)
4110   y(c,p)+=yv(c,p)
4120   IF bounce PROCbounce
4130  NEXT
4140 NEXT
4150 ENDPROC
4160 :
4170 DEF PROCcls
4180 CLS
4190 IF anim=2 PROCpoke(12)
```

```
 4200 ENDPROC
 4210 :
 4220 DEF PROCgcol(col)
 4230 GCOL col
 4240 IF anim=2 PROCpoke(18):PROCpoke(0)
:PROCpoke(col)
 4250 ENDPROC
 4260 :
 4270 DEF PROCcircle(x,y,r)
 4280 CIRCLE FILL x,y,r
 4290 IF anim=2 PROCplot(4,x,y):PROCplot
(153,r,0)
 4300 ENDPROC
 4310 :
 4320 DEF PROCplot(o,x,y)
 4330 PLOT o,x,y
 4340 IF anim=2 PROCpoke(25):PROCpoke(o)
:PROCpoke2(x):PROCpoke2(y)
 4350 ENDPROC
 4360 :
 4370 DEF PROCpoke(v)
 4380 ?store=v:store+=1
 4390 ENDPROC
 4400 :
 4410 DEF PROCpoke2(v)
 4420 IF v<0 v+=65536
 4430 ?store=v MOD 256
 4440 store?1=v DIV 256
 4450 store+=2
 4460 ENDPROC
 4470 :
 4480 DEF PROCcalculate
 4490 IF heavies=0 ENDPROC
 4500 FOR h=1 TO heavies
 4510  hx=hx(h)
 4520  hy=hy(h)
 4530  G=G%*htype(h)
 4540  FOR c=1 TO clusters
 4550   FOR p=1 TO particles
 4560    dx=x(c,p)-hx
 4570    dy=y(c,p)-hy
 4580    r3=(dx*dx+dy*dy)^1.5
 4590     IF r3>700 THEN
 4600     xv(c,p)+=G*dx/r3
 4610     yv(c,p)+=G*dy/r3
 4620     ENDIF
 4630   NEXT
 4640  NEXT
 4650 NEXT
 4660 ENDPROC
 4670 :
 4680 DEF PROCbounce
 4690 IF x(c,p)<xlo OR x(c,p)>xhi x(c,p)
-=xv(c,p):xv(c,p)=-damping*xv(c,p)
 4700 IF y(c,p)<ylo OR y(c,p)>yhi y(c,p)
-=yv(c,p):yv(c,p)=-damping*yv(c,p)
 4710 ENDPROC
 4720 :
 4730 DEF PROCanimate
 4740 SYS 6,112,2:CLS:SYS 6,112,1:CLS
 4750 frame=0
 4760 add=1
 4770 d=1
 4780 REPEAT
 4790  WAIT
 4800  MOUSE x,y,z
 4810  IF z<>0 THEN FOR p=1 TO z:WAIT:NE
XT p
 4820  SYS 6,112,d
 4830  SYS 6,113,3-d:d=3-d
 4840  CASE anim OF
 4850   WHEN 1:SYS spop,&122,memory,STR$
frame,xlo,ylo
 4860   WHEN 2:SYS &46,memory!(frame*4),
vdusize
 4870  ENDCASE
 4880  frame+=add
 4890  IF frame=0 OR frame=frames-1 add=
-add
 4900 UNTIL FALSE
 4910 ENDPROC
 4920 :
 4930 DEF FNget(prompt$,keys$)
 4940 COLOUR 3
 4950 PRINT'prompt$;" ";
 4960 COLOUR 1
 4970 REPEAT
 4980  key$=GET$
 4990  IF key$>="a" AND key$<="z" key$=C
HR$(ASCkey$-32)
 5000 UNTIL INSTR(keys$,key$)
 5010 PRINTkey$
 5020 =INSTR(keys$,key$)-1
 5030 :
 5040 DEF FNinput(prompt$,low,high)
 5050 COLOUR 3
 5060 PRINT'prompt$;" ";:pos=POS:vpos=VP
OS
 5070 COLOUR 1
 5080 REPEAT
 5090  INPUT ""input
 5100  IF input<low OR input>high PRINTT
AB(pos,vpos);SPCLENSTR$input;TAB(pos,vpo
s);
 5110 UNTIL input>=low AND input<=high
 5120 =input
 5130 :
 5140 DEF FNatn(x,y)
 5150 IF x=0 AND y=0 THEN =0
 5160 ax=ABS(x)
 5170 ay=ABS(y)
 5180 IF ax>ay THEN a=90-DEGATN(ay/ax) E
LSE a=DEGATN(ax/ay)
 5190 IF y>=0 AND x<0 THEN =360-a
 5200 IF y>=0 THEN =a
 5210 IF x>=0 THEN =180-a ELSE =180+a
 5220 :
 5230 DEF FNdemoinit(demo)
 5240 RESTORE
 5250 FOR r=1 TO demo
 5260 READ heavies,clusters,particles,st
yle,mode,bounce
 5270 NEXT
 5280 =0
 5290 DATA 2,3,300,1,8,0
 5300 DATA 1,3,300,1,1,0
 5310 DATA 2,3,300,1,1,1
 5320 DATA 3,3,300,1,1,0
 5330 DATA 10,1,300,1,8,0
 5340 :
 5350 DEF FNdemosetup(demo)
 5360 RESTORE 5510
 5370 count=0
 5380 REPEATREAD test
 5390 IF test=1E30 THEN count+=1
 5400 UNTIL count=demo
 5410 FORh=1 TO heavies
 5420 READ hx(h),hy(h),htype(h)
 5430 NEXT
 5440 FORc=1 TO clusters
 5450 READ type(c),xc(c),yc(c)
 5460 READ Amin(c),Amax(c),Rmin(c),Rmax(
c)
 5470 READ Dmin(c),Dmax(c),Vmin(c),Vmax(
c)
 5480 NEXT
 5490 READ xlo,ylo,xhi,yhi
 5500 =0
 5510 DATA 1E30
 5520 DATA 442,518,-1,832,512,-1
 5530 DATA -1,442,518,137.1,419,17,131,0
,0,0,24.4
 5540 DATA 2,832,512,243.4,416.3,60,231.
8,0,0,0,7.2
 5550 DATA 0,0,72,35.4,70.1,713.6,787.1,
20.9,28.8,2.7,6.6
 5560 DATA 199,180,1105,852
 5570 :
 5580 DATA 1E30
 5590 DATA 640,512,-1
 5600 DATA 0,828,494,173.8,236,-161.6,16
1.6,212.9,227.1,4.7,5.8
 5610 DATA 0,490,260,251.9,398.2,108,198
.1,0,9.5,1.7,8
 5620 DATA 0,580,146,338.1,379.1,512.5,5
31.5,95.2,113.2,3.9,13.5
 5630 DATA 250,250,1000,850
 5640 :
 5650 DATA 1E30
 5660 DATA 544,590,1,712,452,1
 5670 DATA 3,622,512,142.6,293.2,-174.4,
174,0,27.9,4.5,4.5
 5680 DATA 0,948,722,229.7,242.3,110.1,6
30.7,350.4,381,2.2,7.2
 5690 DATA 0,412,746,125.4,142.4,157.5,4
79.6,302,329,1.9,3
 5700 DATA 350,350,900,800
 5710 :
 5720 DATA 1E30
 5730 DATA 628,566,-1,616,566,1,886,752,
1
 5740 DATA 0,616,134,11.3,51.3,96.7,200.
5,18.4,35.9,3.6,12.3
 5750 DATA 0,280,354,34.6,73.1,106.2,250
.1,39.4,67.8,4.1,11.7
 5760 DATA 0,616,776,124.8,135.6,38.4,46
4.8,168.9,216.9,2.5,6.9
 5770 DATA 300,250,1000,900
 5780 :
 5790 DATA 1E30
 5800 DATA 568,710,1,568,380,1,466,440,1
,682,446
 5810 DATA 1,406,536,1,748,548,1,418
 5820 DATA 632,1,466,722,1,688,674,1,784
,644,1
 5830 DATA 0,568,558,0,360,0,108.7,0,0,0
,0
 5840 DATA 349,318,853,786
```

Listing 3

```
   10 REM >MutualAtt (Grav3)
   20 REM demonstration of the complexit
y
   30 REM which emerges when several bod
ies
   40 REM influence each others' motion
   50 REM By Mathew Tizard
   60 REM For 32-bit machines
   70 REM (c) BAU March 1993
   80 :
   90 MODE1
  100 ONERROR MODE0:REPORT:PRINT;" at li
ne ";ERL:END
  110 OFF
  120 COLOUR2,2
  130 COLOUR3,4
  140 A=1
  150 B=2
  160 G=-2.4E3
  170 masses=2
  180 DIM mass(masses),X(masses),Y(masse
s)
  190 DIM XV(masses),YV(masses)
  200 FORB=1 TO masses
  210 mass(B)=4*RND(30)+12
  220 X(B)=RND(1280)
  230 Y(B)=RND(1023)
  240 XV(B)=(RND(400)-200)/20
  250 YV(B)=(RND(400)-200)/20
  260 NEXT
  270 :
  280 REPEAT
  290 WAIT
  300 CLS
  310 FOR m=1 TO masses
  320 FOR M=1 TO masses
  330  IF M<>m THEN
  340  dx=X(m)-X(M)
  350  dy=Y(m)-Y(M)
  360  IF dx=0 dx=1E-9
  370  r2=dx*dx+dy*dy
  380   IF r2>5000 THEN
  390   a=G*mass(M)/r2
  400   theta=DEGATN(dy/dx)
  410   IF dx<0 a=-a
  420   XV(m)+=a*COSRAD(theta)
  430   YV(m)+=a*SINRAD(theta)
  440   ENDIF
  450  ENDIF
  460 NEXT M,m
  470 :
  480 FORM=1 TO masses
  490 X(M)+=XV(M):Y(M)+=YV(M)
  500 :
  510 F=-1.6
  520 IF Y(M)<0 Y(M)=0:YV(M)=YV(M)/F
  530 IF Y(M)>1000 Y(M)=1000:YV(M)=YV(M)
/F
  540 IF X(M)<0 X(M)=0:XV(M)=XV(M)/F
  550 IF X(M)>1279 X(M)=1279:XV(M)=XV(M)
/F
  560 :
  570 GCOL M MOD3+1
  580 CIRCLE FILL X(M),Y(M),mass(M)
  590 NEXT M
  600 PRINT"Press any key for a differen
t selection."
  610 SYS 6,112,B:SYS 6,113,A
  620 SWAP A,B
  630 UNTIL INKEY$(0)<>""
```

*INFO

Listing 1

```
   10 REM >BiomorColD (Info1)
   20 REM by C L McAskie
   30 REM from original by A F Reysenbac
h
   40 REM for 32-bit machines
   50 REM (c) BAU March 1993
   60 :
   70 DIM biomorph 300
   80 tt$="BiomorcolD"
   90 data%=TRUE
  100 fil%=0:fil$="Bio"
  110 b=0:p=1
  120 x=2:y=3:r=4
  130 i=5:s=6:j=7
  140 c=8:t=9:u=10
  150 cptr=11
  160 link=14:pc=15
  170 MODE 15
  180 ON ERROR IF INKEY-1 OR ERR<>17 REP
ORT:PRINT" at ye line ";ERL:END
  190 dat_items%=12
  200 dat_line%=0
  210 REPEAT
  220  IF data% THEN
  230   READ const1,const2,shift1,col,de
c,colcnt,rlgr,imgr,sumgr,rlle,imle
  240   shift2=shift1+1
  250   dat_line%+=1
  260   IF dat_line%=dat_items% THEN RES
TORE:dat_line%=0
  270  ELSE
  280   shift1=RND(4)
  290   shift2=shift1+1
  300   dec=RND(40)
  310   const1=(RND(127))<<(RND(7))
  320   const2=(RND(127))<<(RND(7))
  330   col=4*RND(63)+3
  340   colcnt=RND(64)
  350   rlgr=(RND(10)+10)<<(RND(10)+5)
  360   imgr=(RND(10)+10)<<(RND(10)+5)
  370   sumgr=(RND(10)+10)<<(RND(10)+5)
  380   rlle=(RND(10)+10)<<(RND(10)+5)
  390   imle=(RND(10)+10)<<(RND(10)+5)
  400  ENDIF
  410  PROCbio
  420  g$=INKEY$(500)
  430  IF g$="D" OR g$="d" THEN data%=NO
T data%
  440  IF g$="S" OR g$="s" THEN
  450   OSCLI("SCREENSAVE "+fil$+STR$(fi
l%))
  460   fil%+=1
  470   VDU 7
  480  ENDIF
  490  *FX 21
  500 UNTIL FALSE
  510 :
  520 DEF PROCbio
  530 CLS
  540 PRINTtt$;''"RealU"';const1'"ImU"';
const2''"Scale"';shift1'"Col"';col';"Col
Dec"';dec';"Recursns"';colcnt
  550 PRINT'"Real>"';rlgr'"Im>"';imgr'"S
um>"';sumgr''"Real<"';rlle'"Im<"';imle'
  560 IF data% PRINT"Data ";dat_line% EL
SE PRINT"Random"
  570 OFF
  580 FOR pass=0 TO 2 STEP 2
  590 P%=biomorph
  600 [OPT pass
  610 .pix     SWI     "OS_ReadEscapeStat
e"
  620          MOVCS   pc,link
  630          SUBS    p,p,#1
  640          MOVMI   pc,link
  650          MOV     x,p,LSR #8
  660          AND     y,p,#&FF
  670          MOV     c,#col
  680          MOV     cptr,#colcnt
  690          SUB     r,x,#276
  700          MOV     r,r,ASL #shift1
  710          SUB     i,y,#128
  720          MOV     i,i,ASL #shift2
  730 .iter    SUBS    c,c,#dec
  740          SUBEQ   c,c,#dec
  750          SUBS    cptr,cptr,#1
  760          BMI     pix
  770          MUL     s,r,r
  780          MUL     j,i,i
  790          ADD     t,j,j,ASL #1
  800          SUB     t,s,t
  810          MUL     t,r,t
  820          MOV     t,t,ASR #16
  830          SUB     t,t,#const1
  840          ADD     u,s,s,ASL #1
  850          SUB     u,u,j
  860          MUL     u,i,u
  870          MOV     u,u,ASR #16
  880          SUB     u,u,#const2
  890          MOVS    r,t
  900          RSBMI   t,t,#0
  910          MOVS    i,u
  920          RSBMI   u,u,#0
  930          CMP     t,#rlgr
  940          BGE     maybe_plot
  950          CMP     u,#imgr
  960          BGE     maybe_plot
  970          ADD     s,t,u
  980          CMP     s,#sumgr
  990          BGE     maybe_plot
 1000          B       iter
 1010 .maybe_plot
 1020          CMP     t,#rlle
 1030          BLT     plot
 1040          CMP     u,#imle
 1050          BLT     plot
 1060          B       pix
 1070 .plot    MOV     t,y,ASL #9
 1080          ADD     t,t,y,ASL #7
 1090          ADD     t,t,x
 1100          STRB    c,[b,-t]
 1110          B       pix
 1120
 1130 .scr     EQUD 148
 1140          EQUD -1
 1150 ]
 1160 NEXT pass
 1170 SYS "OS_ReadVduVariables",scr,scr
 1180 A%=!scr+&27FFF
 1190 B%=552<<8
 1200 CALL biomorph
 1210 ENDPROC
 1220 :
 1230 DATA 166,80,2,219,27,26,832,114688
,106496,3584,589824
 1240 DATA 166,80,1,219,27,26,832,114688
,106496,3584,589824
 1250 DATA 98,192,1,964,28,61,131072,358
4,212992,20480,6144
 1260 DATA 98,192,0,964,239,61,131072,35
84,212992,20480,6144
 1270 DATA 96,120,2,191,196,12,2816,2949
```

```
12,28672,311296,139264
 1280 DATA 32,352,1,223,133,28,180224,36
864,36864,19456,425984
 1290 DATA 131,114,2,55,200,54,524288,38
912,24576,425984,458752
 1300 DATA 108,16,0,43,32,14,1216,327680
,69632,57344,24576
 1310 DATA 164,244,0,59,17,57,26624,1843
2,360448,360448,10240
 1320 DATA 164,244,1,71,83,60,26624,1843
2,360448,360448,10240
 1330 DATA 166,80,1,300,27,26,832,114688
,106496,3584,589824
 1340 DATA 140,116,1,15,6,33,30720,49152
0,1280,122880,557056
```

Listing 2

```
   10 REM >Bells (Info2)
   20 REM by Nigel Thomas (Campanology b
y R.D.Ferro)
   30 REM for all machines
   40 REM (c) BAU March 1993
   50 :
   60 MODE 7
   70 arc=(HIMEM>&10000)
   80 PROCcursor(FALSE)
   90 PROCinit
  100 PROCscreen
  110 PROCmethods
  120 REPEAT
  130  opt=FNmainmenu
  140  dummy=EVAL("FN"+o$(opt))
  150 UNTIL done
  160 MODE 7
  170 *FX4,0
  180 *FX229,0
  190 *FX225,1
  200 *FX226,128
  210 END
  220 :
  230 DEF PROCinit
  240 DIM name$(16),bells(16),note$(16)
  250 methods=0
  260 file$=""
  270 PROCload("Methods")
  280 method=0
  290 done=FALSE
  300 opt=0
  310 vol=10
  320 delay=-1
  330 DIM o$(5)
  340 FOR i=0 TO 5
  350  READ o$(i)
  360 NEXT
  370 *FX4,1
  380 *FX229,1
  390 *FX225,140
  400 *FX226,140
  410 v$=""
  420 FOR i=33 TO 126
  430  v$=v$+CHR$i
  440 NEXT
  450 notev$="1234567890ET.X0oetx"
  460 DIM note(12),play(12),hold(12),bel
l$(12)
  470 FOR i=1 TO 12
  480  READ note(i)
  490 NEXT
  500 PROCvolume(vol)
  510 ENDPROC
  520 :
  530 DATA Play,Load,Save,Edit,Opts,Quit
  540 DATA 76,68,64,56,48,44,36,28,20,16
,8,0
  550 :
  560 DEF PROCcursor(state)
  570 VDU 23;10,32-state*64;0;0;0;
  580 ENDPROC
  590 :
  600 DEF PROCvolume(v)
  610 ENVELOPE 1,1,0,0,0,0,0,0,126*v/10,
-5,-1,-1,126*v/10,94*v/10
  620 ENDPROC
  630 :
  640 DEF PROCscreen
  650 FOR i=0 TO 1
  660  PRINTTAB(0,i);CHR$132;CHR$157;CHR
$134;CHR$141;"Campanology";CHR$140;
  670 NEXT
  680 PROCfilename
  690 REMVDU 31,0,24,148,ASC"w",135,31,3
8,24,148,ASC"("
  700 PROCopt(opt)
  710 ENDPROC
  720 :
  730 DEF PROCcls
  740 VDU 28,0,23,39,2,12,26
  750 ENDPROC
  760 :
  770 DEF PROCwipe
  780 VDU 28,0,23,39,19,12,26
  790 ENDPROC
  800 :
  810 DEF PROCmethods
  820 FOR i=0 TO 15
  830  VDU 31,0,i+3,129,32,130,i+65,131
  840  IF i<methods PRINTname$(i);:PROCb
ells(i) ELSE PRINTSPC35;
  850 NEXT
  860 ENDPROC
  870 :
  880 DEF PROCbells(m)
  890 VDU 31,36,m+3,134
  900 IF bells(m)=0 VDU 32,32 ELSE PRINT
RIGHT$(" "+STR$bells(m),2);
  910 ENDPROC
  920 :
  930 DEF PROCfilename
  940 rf15$=RIGHT$(file$,15)
  950 PRINTTAB(21,0);CHR$131;STRING$(15-
LENrf15$," ");;"""";rf15$;""""
  960 ENDPROC
  970 :
  980 DEF FNmainmenu
  990 om=-1
 1000 oo=-1
 1010 REPEAT
 1020  IF om<>method PROCwhich(om,FALSE)
:PROCwhich(method,TRUE)
 1030  IF oo<>opt PROCopt(opt)
 1040  om=method
 1050  oo=opt
 1060  key=GET
 1070  Shift=INKEY-1
 1080  IF key>=ASC"a" AND key<=ASC"p" ke
y=key-32
 1090  IF key=136 AND opt>0 opt=opt-1
 1100  IF key=137 AND opt<5 opt=opt+1
 1110  IF key=138 method=(method+1)MOD16
 1120  IF key=139 method=(method+15)MOD1
6
 1130  IF key>140 AND key<147 opt=key-14
1:PROCopt(opt):key=13
 1140  IF key>=ASC"A" AND key<=ASC"P" me
thod=key-65
 1150 UNTIL key=13
 1160 =opt
 1170 :
 1180 DEF PROCwhich(m,f)
 1190 VDU 31,1,m+3:IF f VDU 157 ELSE VDU
 32
 1200 ENDPROC
 1210 :
 1220 DEF PROCopt(o)
 1230 *FX19
 1240 VDU 31,3,24,135
 1250 IF o<>0 FOR i=0 TO o-1:PRINTo$(i);
" ";:NEXT
 1260 VDU 8,129,157,131:PRINTo$(o);:VDU
32,135,156
 1270 IF o<>5 FOR i=o+1 TO 5:PRINTo$(i);
" ";:NEXT
 1280 ENDPROC
 1290 :
 1300 DEF FNQuit
 1310 done=TRUE
 1320 =0
 1330 :
 1340 DEF FNLoad
 1350 a$=FNname("Load")
 1360 IF a$<>"" PROCload(a$):PROCfilenam
e:PROCmethods
 1370 =0
 1380 :
 1390 DEF PROCload(f$)
 1400 in=OPENIN(f$)
 1410 IF in=0 ENDPROC
 1420 methods=0
 1430 REPEAT
 1440  INPUT #in,name$(methods),bells(me
thods),note$(methods)
 1450  methods=methods+1
 1460 UNTIL EOF#in
 1470 CLOSE #in
 1480 file$=f$
 1490 ENDPROC
 1500 :
 1510 DEF FNSave
 1520 a$=FNname("Save")
 1530 IF a$<>"" PROCsave(a$):PROCfilenam
e
 1540 =0
 1550 :
 1560 DEF PROCsave(f$)
 1570 out=OPENOUT(f$)
 1580 null$="":null=0
 1590 FOR i=0 TO 15
 1600 IF name$(i)<>"" PRINT #out,name$(i
),bells(i),note$(i)
 1610 NEXT
 1620 CLOSE #out
 1630 file$=f$
 1640 ENDPROC
 1650 :
 1660 DEF FNname(prompt$)
 1670 VDU 31,0,21,129,157,131
 1680 PRINTprompt$;" file : ";
 1690 name$=FNedit(file$,30,v$,0,FALSE)
 1700 PROCwipe
 1710 =name$
 1720 :
 1730 DEF FNedit(n$,max,valid$,pos,m)
 1740 old$=n$
 1750 exit=FALSE
 1760 PROCcursor(TRUE)
 1770 IF pos=0 pos=LENn$
 1780 x=POS
 1790 y=VPOS
 1800 PRINTn$;
 1810 REPEAT
 1820  VDU 31,x+pos MOD 40,y+pos DIV 40
 1830  key=GET
 1840  shift=INKEY-1
 1850  ctrl=INKEY-2
 1860  step=1-4*shift-LENn$*ctrl
 1870  IF key=136 pos=pos-step:IF pos<0
pos=0
 1880  IF key=137 pos=pos+step:IF pos>LE
Nn$ pos=LENn$
 1890  IF key=138 PROCdown
 1900  IF key=139 PROCup
 1910  IF key=127 AND pos>0 n$=LEFT$(n$,
pos-1)+MID$(n$,pos+1):PRINTCHR$127;MID$(
n$,pos);" ";:pos=pos-1
 1920  IF key=135 AND pos<LENn$ n$=LEFT$
(n$,pos)+MID$(n$,pos+2):PRINTMID$(n$,pos
+1);" ";
 1930  IF key=21 OR key=27 PRINTTAB(x,y)
;SPCLENn$;:n$="":pos=0
 1940  IF key=27 PRINTTAB(x,y);old$;:n$=
old$:pos=LENn$
 1950  IF key=27 OR key=13 exit=TRUE
 1960  IF INSTR(valid$,CHR$key) AND LENn
$<max n$=LEFT$(n$,pos)+CHR$key+MID$(n$,p
os+1):pos=pos+1:PRINTMID$(n$,pos);
 1970 UNTIL exit
 1980 PROCcursor(FALSE)
 1990 =n$
 2000 :
 2010 DEF PROCdown
 2020 IF NOT shift AND pos+40<=LENn$ pos
=pos+40
 2030 IF m<0 OR NOT shift ENDPROC
 2040 IF bells(m)>4 bells(m)=bells(m)-2:
PROCbells(m)
 2050 ENDPROC
 2060 :
 2070 DEF PROCup
 2080 IF NOT shift AND pos>=40 pos=pos-4
0
 2090 IF m<0 OR NOT shift ENDPROC
 2100 IF bells(m)<12 bells(m)=bells(m)+2
:PROCbells(m)
 2110 ENDPROC
 2120 :
 2130 DEF FNEdit
 2140 IF NOT FNoktoedit(method) THEN=0
 2150 IF bells(method)=0 bells(method)=6
:PROCbells(method)
 2160 IF name$(method)="" OR Shift PROCe
ditname
 2170 IF name$(method)="" bells(method)=
0:note$(method)="":PROCbells(method)
 2180 IF name$(method)="" OR Shift OR ke
y=27 THEN=0
 2190 note$=note$(method)
 2200 bad=0
 2210 REPEAT
 2220  VDU 31,0,19
 2230  note$=FNedit(note$,199,notev$,bad
,method)
 2240  bad=FNlegal(note$,bells(method))-
1
 2250  IF bad>=0 VDU 7
 2260 UNTIL bad<0
 2270 note$(method)=note$
 2280 PROCwipe
 2290 =0
 2300 :
 2310 DEF FNoktoedit(m)
 2320 IF name$(m)<>"" THEN =TRUE
 2330 IF m=0 THEN =TRUE
 2340 =(name$(m-1)<>"")
 2350 :
 2360 DEF PROCeditname
 2370 VDU 31,5,method+3
 2380 name$(method)=FNedit(name$(method)
,30,v$+" ",0,method)
 2390 ENDPROC
 2400 :
 2410 DEF FNlegal(n$,b)
 2420 IF LENn$=0 bad=1:=bad
 2430 bad=0
 2440 i=0
 2450 REPEAT
 2460  i=i+1
 2470  c$=MID$(n$,i,1)
 2480  IF c$>="a" AND c$<="z" c$=CHR$(AS
Cc$-32)
 2490  IF c$="0" c$="O"
 2500  in=INSTR(notev$,c$)
 2510  IF in>b AND in<13 bad=i
 2520 UNTIL i=LENn$ OR bad>0
 2530 =bad
 2540 :
 2550 DEF FNOpts
 2560 VDU 31,9,20,130:PRINT"Speaker volu
me :";CHR$135
 2570 VDU 31,9,22,130:PRINT"Practice del
ay :";CHR$135
 2580 REPEAT
 2590  PRINTTAB(27,20);vol;" ";
 2600  PRINTTAB(27,22);
 2610  IF delay<0 PRINT"Off " ELSE d$="0
"+STR$delay:PRINTMID$(d$,LENd$-1,1);"."+
RIGHT$(d$,1);"s"
 2620  key=GET
 2630  IF key=136 AND delay>-1 delay=del
ay-1
 2640  IF key=137 AND delay<99 delay=del
ay+1
 2650  IF key=138 AND vol>0 vol=vol-1
 2660  IF key=139 AND vol<10 vol=vol+1
 2670 UNTIL key=13 OR key=27 OR key=146
 2680 PROCvolume(vol)
 2690 PROCwipe
 2700 =0
 2710 :
 2720 DEF FNPlay
 2730 IF note$(method)="" VDU 7:=0
 2740 PROCcls
 2750 VDU 31,0,2,134,157,132:PRINTname$(
method)
 2760 VDU 28,0,22,39,4
 2770 bells=bells(method)
 2780 note$=note$(method)+"."
 2790 spc$=STRING$((42-bells*3)DIV2-1,"
")
 2800 dur=3+18 DIV bells
 2810 pos=1
 2820 blue=FNgetblue
 2830 IF key=27 PROCcls:PROCmethods:=0
 2840 dochange=FALSE
 2850 changes=FALSE
 2860 stop=FALSE
 2870 gong=0
 2880 line=0
 2890 REPEAT
 2900  key=0
 2910  IF line=0 AND dochange changes=TR
UE
 2920  IF changes PROCchanges
 2930  PRINT'spc$;
 2940  FOR bell=1 TO bells
 2950   PRINTbell$(play(bell));
 2960  NEXT
 2970  bell=1
 2980  REPEAT
 2990   IF bell=blue AND delay>-1 PROCpa
use(dur) ELSE PROCnote(play(bell),dur,TR
UE)
 3000   bell=bell+1
 3010  UNTIL bell>bells OR stop
 3020  line=1-line
 3030  IF line=0 AND NOT stop PROCpause(
dur*2/3):PRINT
 3040  IF key=1 AND NOT changes dochange
=TRUE
 3050 UNTIL stop OR (changes AND FNfinis
hed)
 3060 PROCcls
 3070 PROCmethods
 3080 =0
 3090 :
 3100 DEF FNfinished
 3110 b=0
 3120 REPEAT
 3130  b=b+1
 3140 UNTIL b=bells OR play(b)<>b
 3150 =(play(b)=b)
 3160 :
 3170 DEF FNgetblue
 3180 blue=2
 3190 VDU 31,7,3,129,157,131:PRINT"Selec
t bell to follow ";CHR$156
 3200 REPEAT
 3210  PROCinitbells(1,blue,bells)
 3220  VDU 31,LENspc$,1
 3230  FOR b=1 TO bells
 3240   PRINTbell$(play(b));
 3250  NEXT
 3260  b=blue
 3270  REPEAT
 3280   key=GET
 3290   IF key>=ASC"a" AND key<=ASC"z" k
ey=key-32
 3300   IF key=136 AND blue>2 blue=blue-
1
 3310   IF key=137 AND blue<bells blue=b
lue+1
 3320   i=INSTR(notev$,CHR$key)
 3330   IF i>1 AND i<=bells blue=i
 3340  UNTIL key=13 OR key=27 OR blue<>b
 3350 UNTIL b=blue
 3360 CLS
 3370 =blue
 3380 :
 3390 DEF PROCinitbells(r,b,n)
 3400 FOR i=1 TO n
 3410  bell$(i)=CHR$(135+(i=b)+6*(i=r))+
MID$(notev$,i,1)+" "
 3420  play(i)=i
 3430 NEXT
 3440 ENDPROC
 3450 :
 3460 DEF PROCchanges
 3470 dot=INSTR(note$,".",pos)
 3480 change$=MID$(note$,pos,dot-pos)
 3490 pos=dot+1
 3500 IF pos>LENnote$ pos=1
 3510 IF change$="X" OR change$="x" chan
ge$=""
 3520 FOR b=1 TO bells
 3530  hold(b)=(INSTR(change$,STR$b)>0)
 3540 NEXT
 3550 b=2
 3560 REPEAT
```

```
 3570  IF NOT hold(b-1) AND NOT hold(b)
z=play(b-1):play(b-1)=play(b):play(b)=z:
b=b+1
 3580  b=b+1
 3590 UNTIL b>bells
 3600 ENDPROC
 3610 :
 3620 DEF PROCnote(bell,d,w)
 3630 IF arc SOUND 1,-15*vol/10,note(bel
l),d ELSE SOUND &11,1,note(bell),d:SOUND
 &12,1,note(bell),d:SOUND &13,1,note(bel
l),d
 3640 IF w PROCwait(5*d)
 3650 ENDPROC
 3660 :
 3670 DEF PROCpause(d)
 3680 IF arc SOUND 1,0,0,d ELSE SOUND &1
001,1,9,d:SOUND &1002,1,9,d:SOUND &1003,
1,9,d
 3690 PROCwait(5*d)
 3700 ENDPROC
 3710 :
 3720 DEF PROCwait(wait)
 3730 time=TIME
 3740 REPEAT
 3750  i$=INKEY$0
 3760  IF key=0 key=INSTR("'Cc"+CHR$146+
CHR$27,i$)DIV2:stop=(key=2)
 3770  IF i$=" " AND delay>-1 gong=TIME+
delay*10
 3780  IF TIME>gong AND gong>0 PROCnote(
blue,dur,FALSE):gong=0
 3790 UNTIL TIME-time>wait OR stop
 3800 ENDPROC
```

Listing 3

```
   10 REM >MethPrt (Info3)
   20 REM by Nigel Thomas
   30 REM for all machines
   40 REM (c) BAU March 1993
   50 :
   60 MODE 3
   70 INPUT "Methods file to display : "
methods$
   80 PRINT "Send to printer (Y/N)   : "
;
   90 REPEAT
  100  print=INSTR(" YyNn",GET$)DIV2
  110 UNTIL print>0
  120 IF print=1 VDU 2 ELSE VDU 12,14
  130 in=OPENIN(methods$)
  140 n=0
  150 REPEAT
  160  n=n+1
  170  INPUT #in,name$,bells%,notate$
  180  PRINT'RIGHT$("   "+STR$n,3);" ";n
ame$;" (";bells%;" Bells)"
  190  PRINTTAB(4);notate$
  200 UNTIL EOF#in
  210 CLOSE #in
  220 VDU 3,15
```

Listing 4

```
   10 REM >PolyPat (Info4)
   20 REM by Jan Vibe
   30 REM for 32-bit machines
   40 REM (c) BAU March 1993
   50 :
   60 MODE 12
   70 OFF
   80 DIM x(16,2),y(16,2),px%(32),py%(32
)
   90 DIM pal%(15,2),cyc%(2)
  100 fr%=0
  110 COLOUR 15,0,0,0
  120 COLOUR 128+15
  130 CLS
  140 FOR n%=0 TO 14
  150  FOR i%=0 TO 2
  160   pal%(n%,i%)=&80+&50*COS(n%*2*PI/
15)
  170  NEXT
  180 NEXT
  190 r2=244
  200 r1=140
  210 d=2*SQR(r2^2-(r2/2)^2)
  220 PROCpat(640,512)
  230 REPEAT
  240  PROCcycle
  250 UNTIL FALSE
  260 END
  270 :
  280 DEF PROCpat(x,y)
  290 LOCAL n%,t,px,py
  300 PROCpoly(r1,r2,6,x,y)
  310 FOR n%=30 TO 360 STEP 60
  320  t=RAD(n%)
  330  px=x+d*SIN(t)
  340  py=y+d*COS(t)
  350  IF POINT(px,py)=15 PROCpat(px,py)
  360 NEXT
  370 ENDPROC
  380 :
  390 DEF PROCpoly(r1%,r2%,a%,cx%,cy%)
  400 LOCAL b%,n%,n1%,n2%,p%,v,t
  410 v=180/a%
  420 b%=2*a%
  430 FOR n%=1 TO b%
  440  t=RAD(v*n%)
  450  px%(n%)=cx%+r1%*SIN(t)
  460  py%(n%)=cy%+r1%*COS(t)
  470  SWAP r1%,r2%
  480 NEXT
  490 FOR n%=1 TO b%
  500  n1%=n% MOD b%+1
  510  n2%=n1% MOD b%+1
  520  x(1,1)=px%(n%)
  530  x(2,1)=px%(n1%)
  540  x(3,1)=px%(n2%)
  550  y(1,1)=py%(n%)
  560  y(2,1)=py%(n1%)
  570  y(3,1)=py%(n2%)
  580  PROCp(3,1,17)
  590 NEXT
  600 FOR n%=1 TO a%
  610  p%=2*n%-1
  620  x(n%,1)=px%(p%)
  630  y(n%,1)=py%(p%)
  640 NEXT
  650 PROCp(a%,10,1)
  660 ENDPROC
  670 :
  680 DEF PROCp(k%,d1%,d2%)
  690 LOCAL c%,n%,m%,i%,l%,l1%,p1%,p2%,h
1%,h2%
  700 l%=1000
  710 p1%=1
  720 p2%=2
  730 REPEAT
  740  PROCcycle
  750  c%=c% MOD 28+1
  760  GCOL ABS(14-c%)
  770  MOVE x(1,p1%),y(1,p1%)
  780  MOVE x(k%,p1%),y(k%,p1%)
  790  h1%=1
  800  h2%=k%
  810  i%=0
  820  REPEAT
  830   IF i%=0 h1%+=1:PLOT 85,x(h1%,p1%
),y(h1%,p1%):IF h1%=h2% i%=1
  840   IF i%=0 h2%-=1:PLOT 85,x(h2%,p1%
),y(h2%,p1%):IF h1%=h2% i%=1
  850  UNTIL i%=1
  860  FOR n%=1 TO k%
  870   m%=n% MOD k%+1
  880   x(n%,p2%)=(d1%*x(n%,p1%)+d2%*x(m
%,p1%))/(d1%+d2%)
  890   y(n%,p2%)=(d1%*y(n%,p1%)+d2%*y(m
%,p1%))/(d1%+d2%)
  900   l1%=(x(n%,p2%)-x(m%,p2%))^2+(y(n
%,p2%)-y(m%,p2%))^2
  910   IF l1%<l% l%=l1%
  920  NEXT
  930  SWAP p1%,p2%
  940 UNTIL l%<=64
  950 ENDPROC
  960 :
  970 DEF PROCcycle
  980 LOCAL i%
  990 WAIT
 1000 fr%+=1
 1010 IF fr% MOD 4=0 THEN
 1020  FOR i%=0 TO 2
 1030   cyc%(i%)=(cyc%(i%)+1) MOD 15
 1040  NEXT
 1050  FOR i%=0 TO 14
 1060   COLOUR i%,pal%((cyc%(0)+i%) MOD
15,0),pal%((cyc%(1)+i%) MOD 15,1),pal%((
cyc%(2)+i%) MOD 15,2)
 1070  NEXT
 1080  IF fr% MOD 16=0 THEN
 1090   i%=RND(3)-1
 1100   cyc%(i%)=(cyc%(i%)+1) MOD 15
 1110  ENDIF
 1120 ENDIF
 1130 ENDPROC
```

Listing 5

```
   10 REM >ShadeStar (Info5)
   20 REM by Jan Vibe
   30 REM for 32-bit machines
   40 REM (c) BAU March 1993
   50 :
   60 MODE 15
   70 OFF
   80 cc%=RND(255)
   90 c%=RND(255)
  100 cs%=c%
  110 REPEAT
  120  INPUT"How many points: "pts%
  130  IF pts%=0 pts%=9
  140  step%=360/pts%
  150 UNTIL step%*pts%=360
  160 CLS
  170 FOR n1%=0 TO 359 STEP step%
  180  n2%=n1%+step%/2
  190  n3%=n1%+step%
  200  c1%=c%
  210  c2%=RND(255)
  220  c%=RND(255)
  230  IF n1%=360-step% c%=cs%
  240  x1%=640+256*SINRAD(n1%)
  250  y1%=512+256*COSRAD(n1%)
  260  x2%=640+512*SINRAD(n2%)
  270  y2%=512+512*COSRAD(n2%)
  280  x3%=640+256*SINRAD(n3%)
  290  y3%=512+256*COSRAD(n3%)
  300  PROCct(x1%,y1%,c1%,1,x3%,y3%,c%,1
,640,512,cc%,1)
  310  PROCct(x1%,y1%,c1%,1,x3%,y3%,c%,1
,x2%,y2%,c2%,2)
  320 NEXT
  330 i=GET
  340 END
  350 :
  360 DEF PROCct(x1,y1,c1%,w1,x2,y2,c2%,
w2,x3,y3,c3%,w3)
  370 LOCAL p1(),p2(),p3()
  380 DIM p1(5),p2(5),p3(5)
  390 p1(1)=x1
  400 p1(2)=y1
  410 p1(3)=w1
  420 p2(1)=x2
  430 p2(2)=y2
  440 p2(4)=w2
  450 p3(1)=x3
  460 p3(2)=y3
  470 p3(5)=w3
  480 GCOL 80,0
  490 PROCt(p1(),p2(),p3())
  500 ENDPROC
  510 :
  520 DEF PROCt(p1(),p2(),p3())
  530 LOCAL pa(),pb(),pc(),c(),l,r,n%,m%
  540 DIM pa(5),pb(5),pc(5),c(3)
  550 l+=(p1(1)-p2(1))^2+(p1(2)-p2(2))^2
  560 l+=(p2(1)-p3(1))^2+(p2(2)-p3(2))^2
  570 l+=(p3(1)-p1(1))^2+(p3(2)-p1(2))^2
  580 IF l<=2000 THEN
  590  FOR n%=1 TO 3
  600   c(n%)=p1(n%+2)+p2(n%+2)+p3(n%+2)
  610  NEXT
  620  FOR n%=2 TO 5
  630   VDU 23,n%
  640   FOR m%=1 TO 8
  650    r=RND(1)*(c(1)+c(2)+c(3))
  660    CASE TRUE OF
  670     WHEN r<=c(1):IF RND(1)<=c(1) V
DU c1% ELSE VDU c2%
  680     WHEN r<=c(1)+c(2):IF RND(1)<=c
(2) VDU c2% ELSE VDU c3%
  690    OTHERWISE
  700     IF RND(1)<=c(3) VDU c3% ELSE V
DU c1%
  710    ENDCASE
  720   NEXT
  730  NEXT
  740  MOVE p1(1),p1(2)
  750  MOVE p2(1),p2(2)
  760  PLOT 85,p3(1),p3(2)
  770 ELSE
  780  FOR n%=1 TO 5
  790   pa(n%)=(p1(n%)+p2(n%))/2
  800   pb(n%)=(p2(n%)+p3(n%))/2
  810   pc(n%)=(p3(n%)+p1(n%))/2
  820  NEXT
  830  PROCt(p1(),pa(),pc())
  840  PROCt(pa(),pb(),pc())
  850  PROCt(pc(),pb(),p3())
  860  PROCt(pa(),p2(),pb())
  870 ENDIF
  880 ENDPROC
```

Listing 6

```
   10 REM >DTwelcomeS (Info6)
   20 REM replace RISC OS 3 welcome bann
er
   30 REM for RISC OS 3
   40 REM (c) BAU March 1993
   50 :
   60 DIM code% 4000
   70 FOR i=0 TO 4000-1 STEP 4:i!code%=0
:NEXT
   80 sp=13:link=14:pc=15
   90 FOR I%=4 TO 6 STEP 2:P%=0:O%=code%
  100 [OPT I%
  110 EQUD 0
  120 EQUD 0
  130 EQUD 0
  140 EQUD Service_Call
  150 EQUD Title_String
  160 EQUD Help_String
  170 EQUD 0
  180 EQUD 0
  190 EQUD 0
  200 EQUD 0
  210 EQUD 0
  220 :
  230 .Title_String
  240 EQUS "DesktopWelcome"
  250 EQUB 0
  260 :
  270 .Help_String
  280 EQUS "Desktop Welcome"
  290 EQUB 9
  300 EQUS "0.01 ("
  310 EQUS MID$(TIME$,5,11)
  320 EQUS ")"
  330 EQUB 0
  340 :
  350 ALIGN
  360 :
  370 .Service_Call
  380         TEQ     R1,#&7C
  390         MOVNES  pc,link
  400
  410         STMFD   (sp)!,{R0-R12,link
}
  420
  430         ADR     R0,spr_var
  440         ADR     R1,file_name
  450         MOV     R2,#255
  460         MOV     R3,#0
  470         MOV     R4,#3
  480         SWI     "XOS_ReadVarVal"
  490         BVS     no_sprite
  500         CMP     R4,#0
  510         BNE     no_sprite
  520
  530         MOV     R0,#0
  540         STRB    R0,[R1,R2]
  550
  560         MOV     R0,#20
  570         ADR     R1,file_name
  580         SWI     "XOS_File"
  590         CMP     R0,#0
  600         BEQ     no_sprite
  610         LDR     R0,sprite_type
  620         CMP     R6,R0
  630         BNE     no_sprite
  640
  650         MOV     R0,#6
  660         ADD     R3,R4,#4
  670         SWI     "XOS_Module"
  680         BVS     no_sprite
  690         MOV     R12,R2
  700
  710         STR     R2,[R12]
  720
  730         MOV     R0,#255
  740         ADR     R1,file_name
  750         ADD     R2,R12,#4
  760         MOV     R3,#0
  770         SWI     "XOS_File"
  780         BVS     un_claim
  790
  800         MOV     R0,#&0D:ADD R0,R0,
#&100
  810         MOV     R1,R12
  820         ADR     R2,spr_name
  830         MOV     R3,#16
  840         MOV     R4,#1
  850         SWI     "XOS_SpriteOp"
  860         MOV     R0,#&28:ADD R0,R0,
#&100
  870         SWI     "XOS_SpriteOp"
  880
  890         MOV     R0,R6
  900         MOV     R1,#4
  910         SWI     "XOS_ReadModeVaria
ble"
  920         MOV     R3,R3,ASL R2
  930         MOV     R1,#5
  940         SWI     "XOS_ReadModeVaria
ble"
  950         MOV     R4,R4,ASL R2
  960
  970         MVN     R0,#NOT -1
  980         MOV     R1,#11
  990         SWI     "XOS_ReadModeVaria
ble"
 1000         ADD     R10,R2,#1
 1010         MOV     R1,#12
 1020         SWI     "XOS_ReadModeVaria
ble"
 1030         ADD     R11,R2,#1
 1040
 1050         MOV     R1,#4
 1060         SWI     "XOS_ReadModeVaria
ble"
 1070         MOV     R10,R10,ASL R2
 1080         MOV     R1,#5
 1090         SWI     "XOS_ReadModeVaria
ble"
 1100         MOV     R11,R11,ASL R2
 1110
 1120         SUB     R10,R10,R3
 1130         MOV     R10,R10,LSR #1
 1140         SUB     R11,R11,R4
 1150         MOV     R11,R11,LSR #1
 1160
 1170         MOV     R0,R12
 1180         ADR     R1,spr_name
 1190         MVN     R2,#NOT -1
 1200         MVN     R3,#NOT -1
 1210         ADR     R4,pix_trans
 1220         MOV     R5,#%00
 1230         SWI     "XColourTrans_Sele
ctTable"
 1240
 1250         MOV     R0,#&34:ADD R0,R0,
#&100
 1260         MOV     R1,R12
 1270         ADR     R2,spr_name
 1280         MOV     R3,R10,ASL #16
 1290         MOV     R3,R3,ASR #16
 1300         MOV     R4,R11,ASL #16
 1310         MOV     R4,R4,ASR #16
 1320         MOV     R5,#0
 1330         MOV     R6,#0
 1340         ADR     R7,pix_trans
 1350         SWI     "XOS_SpriteOp"
 1360
 1370 .un_claim
 1380         MOV     R0,#7
 1390         MOV     R2,R12
 1400         SWI     "XOS_Module"
 1410 .no_sprite
 1420         MOV     R1,#0
```

```
1430        STR     R1,[sp,#4]
1440
1450        LDMFD   (sp)!,{R0-R12,link
}
1460        BICS    pc,link,#1<<28
1470
1480 .sprite_type
1490        EQUD    &FF9
1500 .spr_var
1510        EQUS    "Welcome$Sprite"
1520        EQUB    0
1530        ALIGN
1540
1550 .spr_name
1560        FNspace(16)
1570 .pix_trans
1580 .file_name
1590        FNspace(256)
1600 :
1610 ]NEXT
1620 SYS "OS_File",10,"DTwelcome",&FFA,
,code%,O%
1630 END
1640 :
1650 DEF FNspace(n)
1660 P%+=n
1670 O%+=n
1680 =""
```

Listing 7

```
10 REM >1LKlee  by Jan Vibe  (c) BAU
March 1993
20 MODE0:VDU23;8202;0;0;0;:DIMv(4),w(
4):v(2)=16:v(4)=16:w(0)=-8:w(1)=8:w(3)=-
8:i=4^5:REPEATREPEATi=i-8:UNTILPOINT(0,i
)<1:x=0:y=i:REPEATz=-4*(y<=0):z=z-(POINT
(x,y-8)=0)*(3-z):z=z-(POINT(x+16,y)=0)*(
2-z):z=z-(POINT(x,y+8)=0)*(1-z):MOVEx,y:
x=x+v(z):y=y+w(z):DRAWx,y:DRAWx,y+8*(RND
(7)+1)*(RND(1)>.99):UNTILx>=1263:UNTILi<
-32
```

Listing 8

```
10 REM >1LBall (c) BAU March 1993
20 MODE12:OFF:p=PAGE+4^5:z=NOT128:$p=
STRING$(8,CHR$0):ORIGIN640,512:x=0:y=0:R
EPEAT:d=1-d:FORi=0TO15:p=(p+8)ANDz:COLOU
Ri,0,i<<4,0:GCOLi:CIRCLEFILL!p,p!4,i*2:N
EXT:q=(p+8)ANDz:MOUSEm,n,h:MOUSETO0,0:WA
IT:FORi=0TO1:SYS6,112+i,-NOT(i EORd):o=A
BS(!p+x)<618-138*i:!q=!p-o*x:x=m/9-x/500
*(4+9*o)*(99+i)-i:q+=4:p+=4:SWAPx,y:SWAP
m,n:NEXT:CLS:UNTIL0
```

Listing 9

```
10 REM >DaftClock (c) BAU March 1993
20 END=PAGE+4095:DIMq&400:s=262336:SY
Ss,200,&4B534154,"Clock!":REPEATREPEATSY
S66TOt:SYSs+33,,q,t+100TOr:x=(r=17ORr=18
)ANDq!16=0:UNTILr=0ORx:IFr=0OSCLI"Create
 RAM:Clock":UNTILx:SYS s+29 ELSE UNTILx:
SYS s+29
```

Listing 10

```
10 REM >SprDem1 (Info10)
20 REM by DA
30 REM for 32-bit machines
40 REM (c) BAU March 1993
50 :
60 MODE 9
70 PROCset_palette
80 PROCinit_sprite_area
90 PROCmake_demo_sprites(TRUE,0)
100 PROCsave_sprites("sprfileA")
110 PROCinit_sprite_area
120 PROCmake_demo_sprites(FALSE,3)
130 PROCsave_sprites("sprfileB")
140 END
150 :
160 DEF PROCset_palette
170 COLOUR 1,&F0,&F0,&F0
180 COLOUR 2,0,0,0
190 FOR i%=0 TO 3
200  a%=i%*&30+&30
210  COLOUR i%+4,a%,0,0
220  COLOUR i%+8,0,a%,0
230  COLOUR i%+12,0,0,a%
240 NEXT
250 ENDPROC
260 :
270 DEF PROCinit_sprite_area
280 area_size%=4*1024
290 DIM sprites% area_size%
300 !sprites%=area_size%
310 sprites%!8=16
320 SYS "OS_SpriteOp",&109,sprites%
330 ENDPROC
340 :
350 DEF PROCmake_demo_sprites(square%,
base%)
360 VDU 5
370 FOR s%=0 TO 2
380  GCOL 0
390  RECTANGLE FILL 0,0,63,63
400  GCOL 3
410  IF square% RECTANGLE FILL 4,4,56,
56 ELSE CIRCLE FILL 32,32,28
420  GCOL 2
430  MOVE 12,44
440  PRINT;s%+1
450  MOVE 20,44
460  PRINT;s%+1
470  MOVE 16,48
480  PRINT;s%+1
490  MOVE 16,40
500  PRINT;s%+1
510  GCOL 1
520  MOVE 16,44
530  PRINT;s%+1
540  FOR x%=0 TO 63 STEP 4
550   FOR y%=0 TO 63 STEP 4
560    p%=POINT(x%,y%)
570    IF p%=3 GCOL 4*(s% MOD 3+1)+RND
(4)-1:POINT x%,y%
580   NEXT
590  NEXT
600  SYS "OS_SpriteOp",&110,sprites%,S
TR$(s%+base%+1),1,0,0,64,64
610 NEXT
620 ENDPROC
630 :
640 DEF PROCsave_sprites(file$)
650 SYS "OS_SpriteOp",&10C,sprites%,fi
le$
660 VDU 4
670 PRINT"File '"file$"' created"
680 ENDPROC
```

Listing 11

```
10 REM >SprDem2 (Info11)
20 REM by DA
30 REM for 32-bit machines
40 REM (c) BAU March 1993
50 :
60 MODE 9
70 OFF
80 PROCload_sprites
90 PROCset_palette(sprites%,"1")
100 PROCtile
110 PROCscreen_test
120 END
130 :
140 DEF PROCset_palette(sprites%,spr$)
150 SYS "OS_SpriteOp",&118,sprites%,sp
r$ TO ,,spr_dat%
160 pal_dat%=spr_dat%+44
170 FOR i%=0 TO 15
180  COLOUR i%,pal_dat%?(8*i%+1),pal_d
at%?(8*i%+2),pal_dat%?(8*i%+3)
190 NEXT
200 ENDPROC
210 :
220 DEF PROCload_sprites
230 area_size%=8*1024
240 DIM sprites% area_size%
250 !sprites%=area_size%
260 SYS "OS_File",255,"sprfileA",sprit
es%+4
270 SYS "OS_SpriteOp",&10B,sprites%,"s
prfileB"
280 ENDPROC
290 :
300 DEF PROCtile
310 FOR x%=0 TO 1279 STEP 64
320  FOR y%=0 TO 1023 STEP 64
330   spr$=STR$(RND(6))
340   MOVE x%,y%
350   SYS "OS_SpriteOp",&11C,sprites%,
spr$
360  NEXT
370 NEXT
380 ENDPROC
390 :
400 DEF PROCscreen_test
410 SYS "OS_SpriteOp",&102,,"screen",1
420 CLS
430 SYS "OS_SpriteOp",&103,,"screen"
440 ENDPROC
```

Listing 12

```
10 REM >SprDem3 (Info12)
20 REM by DA
30 REM for 32-bit machines
40 REM (c) BAU March 1993
50 :
60 MODE 9
70 OFF
80 PROCload_sprites
90 PROCset_palette(sprites%,"4")
100 PROCmake_masks
110 PROCmask_test
120 END
130 :
140 DEF PROCset_palette(sprites%,spr$)
150 SYS "OS_SpriteOp",&118,sprites%,sp
r$ TO ,,spr_dat%
160 pal_dat%=spr_dat%+44
170 FOR i%=0 TO 15
180  COLOUR i%,pal_dat%?(8*i%+1),pal_d
at%?(8*i%+2),pal_dat%?(8*i%+3)
190 NEXT
200 ENDPROC
210 :
220 DEF PROCload_sprites
230 area_size%=8*1024
240 DIM sprites% area_size%
250 !sprites%=area_size%
260 SYS "OS_File",255,"sprfileB",sprit
es%+4
270 ENDPROC
280 :
290 DEF PROCmake_masks
300 DIM spr%(3)
310 FOR i%=1 TO 3
320  SYS "OS_SpriteOp",&118,sprites%,S
TR$(i%+3) TO ,,spr%(i%)
330  SYS "OS_SpriteOp",&228,sprites%,s
pr%(i%) TO ,,,width%,height%
340  SYS "OS_SpriteOp",&21D,sprites%,s
pr%(i%)
350  FOR x%=0 TO width%-1
360   FOR y%=0 TO height%-1
370    SYS "OS_SpriteOp",&229,sprites%
,spr%(i%),x%,y% TO ,,,,,col%
380    IF col%=0 SYS "OS_SpriteOp",&22
C,sprites%,spr%(i%),x%,y%,0
390   NEXT
400  NEXT
410 NEXT
420 ENDPROC
430 :
440 DEF PROCmask_test
450 PROCpattern("With masks")
460 FOR i%=1 TO 3
470  SYS "OS_SpriteOp",&11E,sprites%,S
TR$(i%+3)
480 NEXT
490 FOR i%=1 TO 3
500  SYS "OS_SpriteOp",&118,sprites%,S
TR$(i%+3) TO ,,spr%(i%)
510 NEXT
520 PROCpattern("Without masks")
530 ENDPROC
540 :
550 DEF PROCpattern(title$)
560 CLS
570 GCOL 3
580 FOR x%=0 TO 1280-16 STEP 16
590  LINE x%,0,x%,1024-16
600 NEXT
610 FOR y%=0 TO 1024-16 STEP 16
620  LINE 0,y%,1280-16,y%
630 NEXT
640 COLOUR 1
650 PRINT title$
660 SYS "OS_SpriteOp",&128,sprites%,"4
" TO ,,,width%,height%
670 FOR i%=0 TO 179
680  x%=640+400*COSRAD(i%*4)-width%*2
690  y%=512+400*COSRAD(i%*7)-height%*2
700  WAIT
710  SYS "OS_SpriteOp",&222,sprites%,s
pr%(i% MOD 3+1),x%,y%,8
720 NEXT
730 wait=INKEY(200)
740 ENDPROC
```

Listing 13

```
10 REM >SprDem4 (Info13)
20 REM by DA
30 REM for 32-bit machines
40 REM (c) BAU March 1993
50 :
60 MODE 9
70 OFF
80 PROCload_sprites
90 PROCsprite_info
100 END
110 :
120 DEF PROCload_sprites
130 area_size%=8*1024
140 DIM sprites% area_size%
150 !sprites%=area_size%
160 SYS "OS_File",255,"sprfileA",sprit
es%+4
170 ENDPROC
180 :
190 DEF PROCsprite_info
200 DIM buffer% &100
210 SYS "OS_SpriteOp",&108,sprites% TO
 ,,size%,no%,first%
220 PRINT"Sprite area at: &";~sprites%
'
230 PRINT"Size: ";size%;" bytes"
240 PRINT"Sprites: ";no%
250 PRINT"Offset to first: &";~first%'
260 n%=1
270 REPEAT
280  SYS "XOS_SpriteOp",&10D,sprites%,
buffer%,&100,n% TO ,,,name_len%;ok%
290  IF (ok% AND 1)=0 THEN
300   PRINT"Sprite """;
310   SYS "OS_Write0",buffer%
320   SYS "OS_SpriteOp",&118,sprites%,
buffer% TO ,,spr%
330   PRINT""" at &";~spr%
340   SYS "OS_SpriteOp",&228,sprites%,
spr% TO ,,,width%,height%,mask%,mode%
350   PRINT" width  : ";width%;" pixel
"FNs(width%)
360   PRINT" height : ";height%;" pixe
l"FNs(height%)
370   PRINT" mask   : ";
380   IF mask%=0 PRINT"no" ELSE PRINT"
yes"
390   PRINT" palette: ";
400   IF spr%!32<>44 PRINT"yes" ELSE P
RINT"no"
410   PRINT" mode   : ";mode%'
420   n%+=1
430  ENDIF
440 UNTIL (ok% AND 1)=1
450 ENDPROC
460 :
470 DEF FNs(n%)
480 IF n%=1 THEN ="" ELSE ="s"
```

Listing 14

```
10 REM >SprDem5
20 REM by DA
30 REM for 32-bit machines
40 REM (c) BAU March 1993
50 :
60 MODE 9
70 OFF
80 PROCload_sprites
90 PROCcat_sprites
100 PROCtest
110 PROCcat_sprites
120 END
130 :
140 DEF PROCload_sprites
150 area_size%=8*1024
160 DIM sprites% area_size%
170 !sprites%=area_size%
180 SYS "OS_File",255,"sprfileA",sprit
es%+4
190 SYS "OS_SpriteOp",&10B,sprites%,"s
prfileB"
200 ENDPROC
210 :
220 DEF PROCcat_sprites
230 DIM buffer% &100
240 PRINT'"Sprites: "
250 n%=1
260 REPEAT
270  SYS "XOS_SpriteOp",&10D,sprites%,
buffer%,&100,n% TO ,,,name_len%;ok%
280  IF (ok% AND 1)=0 THEN
290   PRINT"Sprite """;
300   SYS "OS_Write0",buffer%
310   PRINT""""
320   n%+=1
330  ENDIF
340 UNTIL (ok% AND 1)=1
350 PRINT
360 ENDPROC
370 :
380 DEF PROCtest
390 PROCdelete_sprite("2")
400 PROCdelete_sprite("6")
410 PROCrename_sprite("3","George")
420 PROCrename_sprite("5","Zippy")
430 PROCcopy_sprite("4","Bungle")
440 ENDPROC
450 :
460 DEF PROCdelete_sprite(spr$)
470 PRINT"Deleting sprite """spr$""""
480 SYS "OS_SpriteOp",&119,sprites%,sp
r$
490 ENDPROC
500 :
510 DEF PROCrename_sprite(from$,to$)
520 PRINT"Renaming sprite """from$"""
as """to$""""
530 SYS "OS_SpriteOp",&11A,sprites%,fr
om$,to$
540 ENDPROC
550 :
560 DEF PROCcopy_sprite(from$,to$)
570 PRINT"Copying sprite """from$""" a
s """to$""""
580 SYS "OS_SpriteOp",&11B,sprites%,fr
om$,to$
590 ENDPROC
```

Figure 2 - sprite ops illustrated in this month's Beginners' Bit

Op	Description	R1	R2	R3	R4	R5	R6	R7	Example
2 (&02)	ScreenSave	-	>filename	?palette					SprDem2
3 (&03)	ScreenLoad	-	>filename						SprDem2
8 (&08)	Read control block	>block							SprDem4
	ON EXIT	-	size	sprites	>sprite 1	>first free word			
9 (&09)	Initialise sprite area	>block							SprDem1
10 (&0A)	Load sprite file	>block	>filename						SprDem2-5
11 (&0B)	Merge sprite file	>block	>filename						SprDem2,5
12 (&0C)	Save sprite file	>block	>filename						SprDem1
13 (&0D)	Get sprite name	>block	>buffer	>buf size	sprite number (1, 2, 3...)				SprDem4
	ON EXIT	-	-	name length					
16 (&10)	Get sprite (user)	>block	>sprite	?palette	left	bottom	right	top	SprDem1
	ON EXIT	-	>sprite						
(the sprite is grabbed from the rectangle given in R4-R7. All are inclusive OS co-ordinates)									
24 (&18)	Select sprite	>block	>sprite						SprDem3,4
	ON EXIT	-	>sprite						
25 (&19)	Delete sprite	>block	>sprite						SprDem5
26 (&1A)	Rename sprite	>block	>sprite	>new name					SprDem5
27 (&1B)	Copy sprite	>block	>sprite	>new name					SprDem5
28 (&1C)	Put sprite	>block	>sprite	plot action (see table)					SprDem2
29 (&1D)	Create mask	>block	>sprite						SprDem3
30 (&1E)	Remove mask	>block	>sprite						SprDem3
34 (&22)	Put sprite (user)	>block	>sprite	x	y	plot action			SprDem3
40 (&28)	Read sprite info	>block	>sprite						SprDem4
	ON EXIT	-	-	width	height	?mask	mode		
41 (&29)	Read pixel colour	>block	>sprite	x (pixels)	y (pixels)				SprDem3
44 (&2C)	Write pixel mask	>block	>sprite	x (pixels)	y (pixels)	?mask			SprDem3

Notes:
> means parameter is an address, pointing to required data.
? means parameter is a flag (0 or 1).

GAME DESIGNER

Listing 1

```
10 REM >AlienEd (GameDes1)
20 REM By Antony Bruce Lytis
30 REM For 32 bit machines
40 REM (C) BAU March 1993
50 :
60 MODE 9:OFF
70 MOUSE ON
80 PROCinit
90 PROCload_file(0,"Moves")
100 PROCload_file(1,"Sprites")
110 PROCscreen
120 PROCedit
130 MODE 0
140 END
150 :
160 DEF PROCinit
170 gridx=26
180 gridy=26
190 g=32
200 mid=g/2
210 max_path=100
220 max_len=100
230 DIM paths max_path*max_len*2
240 DIM grid(gridx,gridy)
250 DIM file$(1),type(1)
260 DIM spr$(max_path-1)
270 type()=&FFF,&FF9
280 moves=0
290 quit=FALSE
300 sprites=1
310 FOR p=0 TO max_path-1
320  paths!(p*max_len*2)=&FFFF
330 NEXT
340 xstart=(1280+gridx*g)DIV2
350 ystart=(gridy*g)DIV2
360 path=0
370 space=HIMEM-END-65536
380 DIM sprites space
390 !sprites=space
400 sprites!8=16
410 SYS "OS_SWINumberFromString",,"XOS
_SpriteOp" TO spop
420 SYS spop,&109,sprites
430 ENDPROC
440 :
450 DEF PROCload_file(n,a$)
460 IF FNok(n,a$) THEN
470  file$(n)=a$
480  CASE n OF
490   WHEN 0 : PROCload_data(a$)
500   WHEN 1 : PROCload_sprites(a$)
510  ENDCASE
520 ENDIF
530 PROCname(n)
540 ENDPROC
550 :
560 DEF FNok(n,a$)
570 SYS "OS_File",5,a$ TO a,,type,,siz
e
580 type=(type>>8)AND&FFF
590 IF a<>1 THEN =FALSE
600 IF type<>type(n) THEN =FALSE
610 IF n=1 AND size>space THEN =FALSE
620 =TRUE
630 :
640 DEF PROCload_data(file$)
650 in=OPENIN(file$)
660 p=0
670 REPEAT
680  line$=GET$#in
690  IF LEFT$(line$,1)<>";" AND line$<
>"" THEN
700   spr$(p)=FNstrip(LEFT$(line$,14))
710   path$=MID$(line$,15)
720   a=paths+p*max_len*2
730   a?0=ASCMID$(path$,1,1)-64
740   a?1=ASCMID$(path$,2,1)-64
750   FOR i=2 TO LENpath$-1
760    a?i=FNasc(MID$(path$,i+1,1))
770   NEXT
780   a?i=0
790   a?(i+1)=0
800   p+=1
810  ENDIF
820 UNTIL EOF#in
830 CLOSE #in
840 ENDPROC
850 :
860 DEF FNstrip(s$)
870 WHILE LEFT$(s$,1)=" "
880  s$=MID$(s$,2)
890 ENDWHILE
900 WHILE RIGHT$(s$,1)=" "
910  s$=LEFT$(s$)
920 ENDWHILE
930 =s$
940 :
950 DEF PROCload_sprites(file$)
960 SYS spop,&10A,sprites,file$
970 ENDPROC
980 :
990 DEF PROCscreen
1000 COLOUR 1,1
1010 COLOUR 2,2
1020 COLOUR 3,4
1030 COLOUR 4,4
1040 COLOUR 5,1
1050 COLOUR 6,2
1060 COLOUR 7,7
1070 COLOUR 8,0,0,&CC
1080 COLOUR 9,&CC,&CC,0
1090 COLOUR 10,&88,&CC,&CC
1100 COLOUR 11,&FF,&88,&44
1110 COLOUR 12,&44,&CC,&44
1120 PROCaname("File",0)
1130 PROCaname("Sprs",2)
1140 COLOUR 128
1150 COLOUR 10
1160 PRINTTAB(0,4);"Path:
   Test  Save  Quit"
1170 GCOL 7
1180 FOR x=0 TO gridx
1190  FOR y=0 TO gridy
1200   POINT x*g,y*g
1210  NEXT
1220 NEXT
1230 PROCname(0)
1240 PROCname(1)
1250 ENDPROC
1260 :
1270 DEF PROCaname(label$,ypos)
1280 COLOUR 128
1290 COLOUR 7
1300 PRINTTAB(0,ypos);LEFT$(label$+STRI
NG$(5," "),5);":";
1310 COLOUR 136
1320 PRINTTAB(7,ypos);STRING$(33," ");
1330 COLOUR 128
1340 ENDPROC
1350 :
1360 DEF PROCname(n)
1370 COLOUR 136
1380 COLOUR 9
1390 PRINTTAB(7,n*2);file$(n);SPC(32-LE
Nfile$(n));
1400 COLOUR 128
1410 ENDPROC
1420 :
1430 DEF PROCinfo(p)
1440 COLOUR 11
1450 spr$=spr$(p)
1460 IF spr$="" spr$=""""""
1470 PRINTTAB(6,4);RIGHT$("   "+STR$p,3
);" ";
1480 IF NOT FNexists(spr$) COLOUR 1
1490 PRINT LEFT$(spr$+STRING$(12," "),1
2);
1500 ENDPROC
1510 :
1520 DEF FNexists(s$)
1530 SYS spop,&118,sprites,s$ TO ;v
1540 =(v AND 1)=0
1550 :
1560 DEF PROCview(p)
1570 PROCinfo(p)
1580 PROCdraw(p)
1590 len=FNset_grid(p)
1600 PROCpreview(p)
1610 ENDPROC
1620 :
1630 DEF PROCedit
1640 PROCview(path)
1650 held=FALSE
1660 REPEAT
1670  REPEAT
1680   MOUSE x,y,z
1690   shift=INKEY-1
1700   ctrl=INKEY-2
1710   IF z=0 held=FALSE
1720 IF INKEY-97 THEN *ScreenSave :0.$.
Screen
1730  UNTIL z<>0
1740  IF z<>0 AND NOT held THEN
1750   held=TRUE
1760   CASE TRUE OF
1770    WHEN y>gridy*g:PROCselect
1780    WHEN x>gridx*g:PROCrepos
1790    OTHERWISE     :PROCgrid
1800   ENDCASE
1810  ENDIF
1820 UNTIL quit
1830 ENDPROC
1840 :
1850 DEF PROCselect
1860 xpos=x DIV 32
1870 ypos=31-(y DIV 32)
1880 CASE ypos OF
1890  WHEN 0,2:
1900   PROCload(ypos DIV 2)
1910  WHEN 4:
1920   CASE TRUE OF
1930    WHEN xpos>=0  AND xpos<=8  : PR
```

```
OCnewpath
 1940    WHEN xpos>=10 AND xpos<=21 : PR
OCnewsprite
 1950    WHEN xpos>=24 AND xpos<=27 : PR
OCtest
 1960    WHEN xpos>=30 AND xpos<=33 : PR
OCsave
 1970    WHEN xpos>=36 AND xpos<=39 : he
ld=FALSE:IF z=7 quit=TRUE
 1980   ENDCASE
 1990 ENDCASE
 2000 ENDPROC
 2010 :
 2020 DEF PROCnewpath
 2030 PROCdraw(path)
 2040 IF z AND 4 path+=1:IF path=max_pat
h path=0
 2050 IF z AND 1 path-=1:IF path<0 path=
max_path-1
 2060 PROCview(path)
 2070 ENDPROC
 2080 :
 2090 DEF PROCnewsprite
 2100 COLOUR 128
 2110 COLOUR 11
 2120 IF spr$(path)="" VDU 31,10,4,32,32
 2130 name$=FNalter(spr$(path),10,4,12)
 2140 IF name$<>"" OR key<>27 THEN
 2150  spr$(path)=name$
 2160 ENDIF
 2170 PROCinfo(path)
 2180 ENDPROC
 2190 :
 2200 DEF PROCsave
 2210 COLOUR 136:COLOUR 9
 2220 name$=FNalter(file$(0),7,n*2,28)
 2230 IF name$<>"" THEN
 2240  PROCsave_file(name$)
 2250 ENDIF
 2260 ENDPROC
 2270 :
 2280 DEF PROCsave_file(file$)
 2290 out=OPENOUT(file$)
 2300 PROCbput(out,"; >"+file$)
 2310 PROCbput(out,"")
 2320 FOR p=0 TO max_path-1
 2330  a=paths+p*max_len*2
 2340  IF NOT (?a=255 AND a?1=255) THEN
 2350   spr$=LEFT$(spr$(p)+STRING$(12,"
"),12)
 2360   path$=CHR$(?a+64)+CHR$(a?1+64)
 2370   i=2
 2380   WHILE NOT (a?i=0 AND a?(i+1)=0)
 2390    path$+=FNchr(a?i)+FNchr(a?(i+1)
)
 2400    i+=2
 2410   ENDWHILE
 2420   PROCbput(out," "+spr$+" "+path$)
 2430  ENDIF
 2440 NEXT
 2450 CLOSE #out
 2460 SYS "OS_File",18,file$,&FFF
 2470 file$(0)=file$
 2480 ENDPROC
 2490 :
 2500 DEF FNchr(x)
 2510 IF x<127 THEN =CHR$(96+(127-x))
 2520 =CHR$(64+(x-127))
 2530 :
 2540 DEF FNasc(x$)
 2550 IF x$>="a" THEN =127-(ASCx$-96)
 2560 =127+(ASCx$-64)
 2570 :
 2580 DEF PROCbput(f,s$)
 2590 BPUT #f,s$+CHR$10;
 2600 ENDPROC
 2610 :
 2620 DEF PROCload(n)
 2630 COLOUR 136:COLOUR 9
 2640 name$=FNalter(file$(n),7,n*2,28)
 2650 IF name$<>"" THEN
 2660  PROCload_file(n,name$)
 2670  IF n=0 PROCview(path)
 2680 ENDIF
 2690 ENDPROC
 2700 :
 2710 DEF FNalter(old$,x,y,max)
 2720 VDU 31,x+LENold$,y
 2730 a$=old$
 2740 ON
 2750 MOUSE OFF
 2760 *FX229,1
 2770 *FX21,0
 2780 REPEAT
 2790  key=GET
 2800  IF key=127 AND LENa$>0 VDU 127:a$
=LEFT$(a$)
 2810  IF key=21 OR key=27 PRINTSTRING$(
LENa$,CHR$127);:a$=""
 2820  IF key=27 a$=old$:PRINTa$;
 2830  IF key>32 AND key<127 AND LENa$<m
ax a$+=CHR$key:VDU key
 2840 UNTIL key=13 OR key=27
 2850 IF key=27 a$=""
 2860 *FX229,0
 2870 OFF
 2880 MOUSE ON
 2890 COLOUR 128
 2900 =a$
 2910 :
 2920 DEF PROCrepos
 2930 xstart=x
 2940 ystart=y
 2950 PROCpreview(path)
 2960 ENDPROC
 2970 :
 2980 DEF FNerr(p,xn,yn,at)
 2990 LOCAL a,x,y,ox,oy
 3000 a=paths+p*max_len*2
 3010 at=a+at*2
 3020 ox=?at:oy=at?1
 3030 ?at=xn:at?1=yn
 3040 x=a?0
 3050 y=a?1
 3060 err=FNoff(x,y)
 3070 IF NOT (x=255 AND y=255) THEN
 3080  a+=2
 3090  WHILE NOT (?a=0 AND a?1=0) AND NO
T err
 3100   x+=(a?0-127)
 3110   y+=(a?1-127)
 3120   a+=2
 3130   err=FNoff(x,y)
 3140  ENDWHILE
 3150 ENDIF
 3160 ?at=ox
 3170 at?1=oy
 3180 =err
 3190 :
 3200 DEF FNoff(xx,yy)
 3210 =(xx<0 OR yy<0 OR xx>=gridx OR yy>
=gridy)
 3220 :
 3230 DEF FNset_grid(p)
 3240 grid()=-1
 3250 a=paths+p*max_len*2
 3260 x=a?0
 3270 y=a?1
 3280 l=0
 3290 IF NOT (x=255 AND y=255) THEN
 3300  grid(x,y)=l
 3310  l+=1
 3320  a+=2
 3330  WHILE NOT (?a=0 AND a?1=0)
 3340   x+=(a?0-127)
 3350   y+=(a?1-127)
 3360   IF grid(x,y)<0 grid(x,y)=l
 3370   a+=2
 3380   l+=1
 3390  ENDWHILE
 3400 ENDIF
 3410 =l
 3420 :
 3430 DEF PROCdraw(p)
 3440 LOCAL a,x,y,ox,oy
 3450 a=paths+p*max_len*2
 3460 x=a?0
 3470 y=a?1
 3480 l=0
 3490 IF NOT (x=255 AND y=255) THEN
 3500  GCOL 3,1
 3510  CIRCLE x*g+mid,y*g+mid,mid-4
 3520  ox=x*g+mid
 3530  oy=y*g+mid
 3540  l+=1
 3550  a+=2
 3560  WHILE NOT (?a=0 AND a?1=0)
 3570   x+=(a?0-127)
 3580   y+=(a?1-127)
 3590   GCOL 3,2
 3600   CIRCLE x*g+mid,y*g+mid,mid-4
 3610   GCOL 3,4
 3620   MOVE ox,oy
 3630   ox=x*g+mid
 3640   oy=y*g+mid
 3650   DRAW ox,oy
 3660   a+=2
 3670   l+=1
 3680  ENDWHILE
 3690 ENDIF
 3700 xend=x
 3710 yend=y
 3720 ENDPROC
 3730 :
 3740 DEF PROCgrid
 3750 xg=x DIV g
 3760 yg=y DIV g
 3770 a=paths+path*max_len*2
 3780 e=grid(xg,yg)
 3790 IF ctrl THEN
 3800  PROCdelete_point
 3810 ELSE
 3820  PROCadd_point
 3830 ENDIF
 3840 ENDPROC
 3850 :
 3860 DEF PROCadd_point
 3870 IF e<0 THEN
 3880  IF len=0 THEN
 3890   ?a=xg
 3900   a?1=yg
 3910   GCOL 3,1
 3920   CIRCLE xg*g+mid,yg*g+mid,mid-4
 3930  ELSE
 3940   a?(len*2)  =xg-xend+127
 3950   a?(len*2+1)=yg-yend+127
 3960   GCOL 3,2
 3970   CIRCLE xg*g+mid,yg*g+mid,mid-4
 3980   GCOL 3,4
 3990   LINE xend*g+mid,yend*g+mid,xg*g+
mid,yg*g+mid
 4000  ENDIF
 4010  xend=xg
 4020  yend=yg
 4030  grid(xg,yg)=len
 4040  len+=1
 4050  a?(len*2)=0
 4060  a?(len*2+1)=0
 4070  PROCpreview(path)
 4080 ELSE
 4090  ox=xg
 4100  oy=yg
 4110  REPEAT
 4120   REPEAT
 4130    MOUSE x,y,z
 4140    x1=x DIV g
 4150    y1=y DIV g
 4160    shift=INKEY-1
 4170   UNTIL z=0 OR x1<>ox OR y1<>oy
 4180   IF z<>0 THEN
 4190    IF (NOT shift) OR e=0 OR e=len-
1 THEN
 4200     IF e=0 THEN
 4210      xnew=x1
 4220      ynew=y1
 4230     ELSE
 4240      xnew=a?(e*2)  +x1-ox
 4250      ynew=a?(e*2+1)+y1-oy
 4260     ENDIF
 4270     off=FNerr(path,xnew,ynew,e)
 4280     IF NOT off THEN
 4290      PROCdraw(path)
 4300      a?(e*2)=xnew
 4310      a?(e*2+1)=ynew
 4320      PROCdraw(path)
 4330      PROCpreview(path)
 4340     ENDIF
 4350    ELSE
 4360     off=FNoff(x1,y1)
 4370     IF NOT off THEN
 4380      PROCdraw(path)
 4390      a?(e*2)  +=(x1-ox)
 4400      a?(e*2+1)+=(y1-oy)
 4410      a?(e*2+2)+=(ox-x1)
 4420      a?(e*2+3)+=(oy-y1)
 4430      PROCdraw(path)
 4440      PROCpreview(path)
 4450     ENDIF
 4460    ENDIF
 4470    IF NOT off ox=x1:oy=y1
 4480   ENDIF
 4490  UNTIL z=0
 4500  len=FNset_grid(path)
 4510 ENDIF
 4520 ENDPROC
 4530 :
 4540 DEF PROCdelete_point
 4550 del=FALSE
 4560 CASE TRUE OF
 4570  WHEN e=0:
 4580   IF len=1 THEN
 4590    PROCdraw(path)
 4600    !a=&FFFF
 4610    del=TRUE
 4620   ENDIF
 4630  WHEN e>0:
 4640   IF FNerr(path,127,127,e) THEN
 4650    REM off
 4660   ELSE
 4670    PROCdraw(path)
 4680    i=a+e*2
 4690    REPEAT
 4700     xi=i?2
 4710     yi=i?3
 4720     ?i=xi
 4730     i?1=yi
 4740     i+=2
 4750    UNTIL xi=0 AND yi=0
 4760    del=TRUE
 4770   ENDIF
 4780  ENDIF
 4790 ENDCASE
 4800 IF del THEN
 4810  PROCdraw(path)
 4820  PROCpreview(path)
 4830  len=FNset_grid(path)
 4840 ENDIF
 4850 ENDPROC
 4860 :
 4870 DEF PROCpreview(p)
 4880 LOCAL a,i
 4890 a=paths+p*max_len*2
 4900 VDU 24,gridx*g+4;0;1279;gridy*g;16
 4910 GCOL 0,4
 4920 MOVE xstart,ystart
 4930 IF NOT (a?0=255 AND a?1=255) THEN
 4940  FOR times=1 TO 5
 4950   i=2
 4960   WHILE NOT (a?i=0 AND a?(i+1)=0)
 4970    DRAW BY 4*(a?i-127),4*(a?(i+1)-
127)
 4980    i+=2
 4990   ENDWHILE
 5000  NEXT
 5010 ENDIF
 5020 VDU 26
 5030 ENDPROC
 5040 :
 5050 DEF PROCtest
 5060 spr$=spr$(path)
 5070 IF FNexists(spr$) AND len>1 THEN
 5080  MODE 12:MODE 9:OFF
 5090  MOUSE ON
 5100  *FX229,1
 5110  PROCset_palette(spr$)
 5120  start=paths+path*max_len*2+2
 5130  x=640
 5140  y=512
 5150  b=1
 5160  a=start
 5170  waits=1
 5180  REPEAT
 5190   FOR w=1 TO waits:WAIT:NEXT
 5200   SYS 6,112,b
 5210   SYS 6,113,3-b
 5220   b=3-b
 5230   CLS
 5240   SYS spop,&122,sprites,spr$,x,y,8
 5250   IF a?0=0 AND a?1=0 a=start
 5260   x+=4*(a?0-127)
 5270   y+=4*(a?1-127)
 5280   a+=2
 5290   MOUSE mx,my,z
 5300   IF z=0 held=FALSE
 5310   IF z>0 AND NOT held x=mx:y=my:he
ld=TRUE
 5320   k=INKEY0
 5330   IF k>=ASC"0" AND k<=ASC"9" waits
=k-48:IF waits=0 waits=10
 5340  UNTIL k=27
 5350  *FX 229,0
 5360  SYS 6,112,1
 5370  SYS 6,113,1
 5380  CLS
 5390  PROCscreen
 5400  PROCview(path)
 5410 ENDIF
 5420 ENDPROC
 5430 :
 5440 DEF PROCset_palette(s$)
 5450 SYS spop,&125,sprites,s$,-1 TO ,,,
,pal
 5460 IF pal<>0 THEN
 5470  FOR col=0 TO 15
 5480   COLOUR col,pal?1,pal?2,pal?3
 5490   pal+=8
 5500  ENDIF
 5510 NEXT
 5520 ENDPROC
```

Listing 2

```
   10 REM >AlienMove (GameDes2)
   20 REM By Antony Bruce Lytis
   30 REM For 32 bit machines
   40 REM (C) BAU March 1993
   50 :
   60 MODE 9:OFF
   70 MOUSE ON
   80 PROCinit
   90 PROCload_sprites("Sprites")
  100 loaded=FNload_data("Moves")
  110 PROCrandom
  120 END
  130 :
  140 DEF PROCinit
  150 max_path=100
  160 max_len=100
  170 DIM paths max_path*max_len*2
  180 DIM spr$(max_path-1)
  190 quit=FALSE
  200 FOR p=0 TO max_path-1
  210  paths!(p*max_len*2)=&FFFF
  220 NEXT
  230 space=HIMEM-END-65536
  240 DIM sprites space
  250 !sprites=space
  260 sprites!8=16
  270 SYS "OS_SWINumberFromString",,"XOS
_SpriteOp" TO spop
  280 SYS spop,&109,sprites
  290 ENDPROC
  300 :
  310 DEF FNload_data(file$)
  320 in=OPENIN(file$)
  330 p=0
  340 REPEAT
  350  line$=GET$#in
  360  IF LEFT$(line$,1)<>";" AND line$<
>"" THEN
  370   spr$=FNstrip(LEFT$(line$,14))
  380   IF FNexists(spr$) THEN
  390    spr$(p)=spr$
  400    path$=MID$(line$,15)
  410    a=paths+p*max_len*2
  420    a?0=ASCMID$(path$,1,1)-64
  430    a?1=ASCMID$(path$,2,1)-64
  440    FOR i=2 TO LENpath$-1
  450     a?i=FNasc(MID$(path$,i+1,1))
  460    NEXT
  470    a?i=0
  480    a?(i+1)=0
  490    p+=1
  500   ENDIF
  510  ENDIF
  520 UNTIL EOF#in
  530 CLOSE #in
  540 =p
```

```
550 :
560 DEF FNexists(s$)
570 SYS spop,&118,sprites,s$ TO ;v
580 =(v AND 1)=0
590 :
600 DEF FNasc(x$)
610 IF x$>="a" THEN =127-(ASCx$-96)
620 =127+(ASCx$-64)
630 :
640 DEF FNstrip(s$)
650 WHILE LEFT$(s$,1)=" "
660  s$=MID$(s$,2)
670 ENDWHILE
680 WHILE RIGHT$(s$,1)=" "
690  s$=LEFT$(s$)
700 ENDWHILE
710 =s$
720 :
730 DEF PROCload_sprites(file$)
740 SYS spop,&10A,sprites,file$
750 ENDPROC
760 :
770 DEF PROCrandom
780 MODE 12:MODE 9:OFF
790 PROCset_palette(spr$(0))
800 next=TIME-100
810 max=20
820 DIM x(max),y(max),p(max),i(max),n(
max)
830 active=0
840 waits=2
850 b=1
860 REPEAT
870  IF TIME>next AND active<max THEN
880   i=0
890   WHILE n(i)<>0
900    i+=1
910   ENDWHILE
920   x(i)=RND(1280)
930   y(i)=RND(1024)
940   p(i)=RND(loaded)-1
950   i(i)=2
960   n(i)=RND(30)+10
970   active+=1
980   next=TIME+500
990  ENDIF
1000 FOR w=1 TO waits:WAIT:NEXT
1010 SYS 6,112,b
1020 SYS 6,113,3-b
1030 b=3-b
1040 CLS
1050 FOR i=0 TO max
1060  IF n(i)<>0 SYS spop,&122,sprites
,spr$(p(i)),x(i),y(i),8
1070 NEXT
1080 FOR i=0 TO max
1090  IF n(i)>0 THEN
1100   a=paths+p(i)*max_len*2+i(i)
1110   IF ?a=0 AND a?1=0 THEN
1120    i(i)=2
1130    a=paths+p(i)*max_len*2+2
1140    n(i)-=1
1150    IF x(i)<-32 OR y(i)<-32 OR x(i
)>1280+32 OR y(i)>1024+32 n(i)=0
1160    IF n(i)=0 active-=1
1170   ENDIF
1180   x(i)+=4*(a?0-127)
1190   y(i)+=4*(a?1-127)
1200   i(i)+=2
1210  ENDIF
1220 NEXT
1230 k=INKEY0
1240 IF k>=ASC"0" AND k<=ASC"9" waits=
k-48:IF waits=0 waits=10
1250 UNTIL FALSE
1260 ENDPROC
1270 :
1280 DEF PROCset_palette(s$)
1290 SYS spop,&125,sprites,s$,-1 TO ,,,
,pal
1300 IF pal<>0 THEN
1310  FOR col=0 TO 15
1320   COLOUR col,pal?1,pal?2,pal?3
1330   pal+=8
1340  ENDIF
1350 NEXT
1360 ENDPROC
```

Listing 3

```
  ; >Moves

 Alien1
KPA@@A@B@CB@Ac@bbccbcAbDACB@Ac
 Alien2
FN@A@A@B@CA@A@B@C@@a@a@b@cA@A@B@C@@a@a@-
b@ca@a@b@c@c@d@AABBBBBBa@a@b@c@
 Alien3
KOBAA@Ab@aacbac@cBaCACBBCBDACbCd@ecddcf-
cfBbH@FCEFBEAF@DeAfajgdnAcLAIIC
 Alien1
CEBBAABBAABBAABBAABBAA@a@a@aaabbaabbaab-
b@a@a@a
 Alien2
@N@CACBBCBCaBbAcAc@dAdAdCaC@CBAE@EaFcCc-
@baaabdacafadbbcabBaE
 Alien3
@RBABCCADAC@DaBbBcBc@dbAcBbBbAcAb@cabab-
bac@aA@AABACAC@CaCaBbBc
```

ASSEMBLY LINE

Listing 1

```
10 REM >ARM1
20 REM By Dave Lawrence
30 REM For 32 bit machines
40 REM (C) BAU March 1993
50 :
60 MODE 8:MODE 0:OFF
70 read=10
80 write=11
90 lines=12
100 sp=13:link=14:pc=15
110 DIM code 400
120 FOR pass=0 TO 2 STEP 2:P%=code
130 [OPT pass
140 .scroll
150         LDR    write,screen
160         ADD    read,write,#80
170
180         MOV    lines,#256
190 .move
200         LDMIA  (read)!,{R0-R9}
210         STMIA  (write)!,{R0-R9}
220         LDMIA  (read)!,{R0-R9}
230         STMIA  (write)!,{R0-R9}
240
250         SUBS   lines,lines,#1
260         BNE    move
270
280         MOV    pc,link
290
300
310 .screen EQUD   148
320         EQUD   -1
330
340 ]NEXT
350 SYS "OS_ReadVduVariables",screen,s
creen
360 REPEAT
370  WAIT
380  POINT RND(1280),RND(1024)
390  CALL scroll
400 UNTIL 0
```

Listing 2

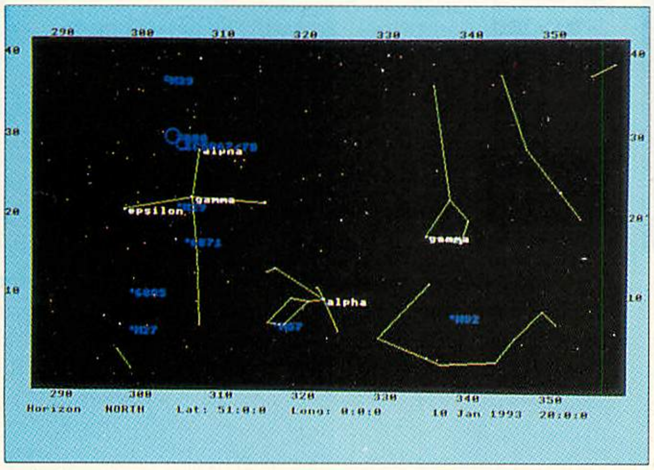
```
10 REM >ARM2
20 REM By Dave Lawrence
30 REM For 32 bit machines
40 REM (C) BAU March 1993
50 :
60 number=10
70 PROCcode
80 PROCsetup
90 A%=number
100 CALL calc
110 PROCresults
120 END
130 :
140 DEF PROCcode
150 x=0:a=1:c=2:sum=3
160 sp=13:link=14:pc=15
170 DIM code 400
180 FOR pass=0 TO 2 STEP 2:P%=code
190 [OPT pass
200 .calc   STMFD  (sp)!,{link}
210
220         MOV    R9,R0
230         ADR    R10,data
240 .loop
250         LDMIA  R10!,{R0-R3}
260
270         SUB    R2,R2,R0
280         MUL    R0,R2,R2
290
300         SUB    R3,R3,R1
310         MLA    R0,R3,R3,R0
320
330         BL     sqr
340
350         STMIA  R10!,{R0}
360
370         SUBS   R9,R9,#1
380         BNE    loop
390
400         LDMFD  (sp)!,{pc}
410
420
430 .sqr    STMFD  (sp)!,{R1-R3,link}
440
450         MOV    a,#1
460         MOV    c,#0
470         B      cmp
480 .loop1
490         MOV    a,a,ASL #2
500 .cmp
510         CMP    a,x
520         BLT    loop1
530 .loop2
540         ADD    sum,a,c
550         MOV    c,c,LSR #1
560
570         CMP    x,sum
580         SUBGE  x,x,sum
590         ADDGE  c,c,a
600
610         MOVS   a,a,LSR #2
620         BNE    loop2
630
640         CMP    c,x
650         ADDLT  c,c,#1
660
670         MOV    R0,c
680
690         LDMFD  (sp)!,{R1-R3,pc}
700 .data
710 ]NEXT
720 ENDPROC
730 :
740 DEF PROCsetup
750 FOR n=0 TO number-1
760  data!(n*20+0 )=RND(100)
770  data!(n*20+4 )=RND(100)
780  data!(n*20+8 )=RND(100)
790  data!(n*20+12)=RND(100)
800 NEXT
810 ENDPROC
820 :
830 DEF PROCresults
840 FOR n=0 TO number-1
850  x1=data!(n*20+0)
860  y1=data!(n*20+4)
870  x2=data!(n*20+8)
880  y2=data!(n*20+12)
890  arm=data!(n*20+16)
900  basic=INT(SQR((x2-x1)^2+(y2-y1)^2
)+0.5)
910  PRINT"(";x1;",";y1;") (";x2;",";y
2;")";TAB(19);"ARM=";arm;TAB(28);"BASIC=
";basic
920 NEXT
930 ENDPROC
```

NOTES

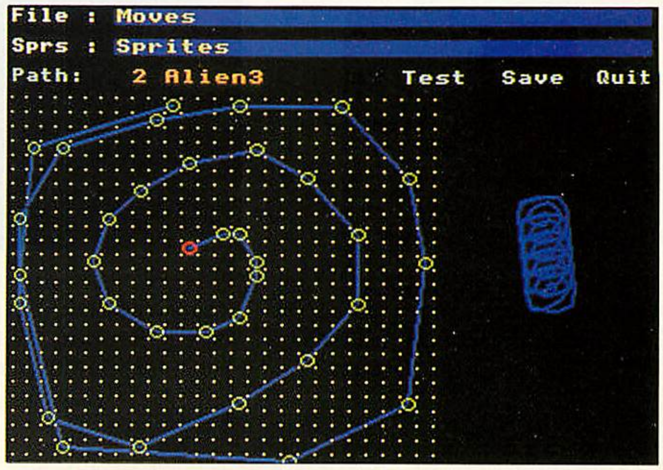
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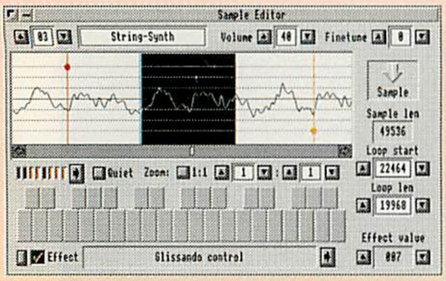
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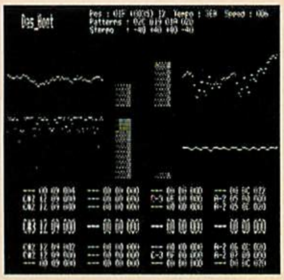
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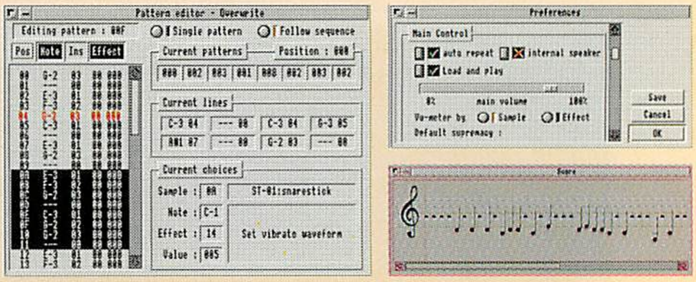
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Perfect ProTracker Implementation · MIDI Compatible
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Archivist

Powerful Database

Cards are created with the Designer part of the package, a new form can be designed simply by selecting fields, and dragging them to their required position.

Text, Integer, & Real field types can be set,in addition to multiple format Date fields, and Formula fields with user definable equations.

Alterations, for example - extra fields can be added to a card, even if you have started imputing data, and no data will be lost.

Archivist is able to Store and Display or Play Textfiles, Sprites, Drawfiles, Maestros, Samples and Soundtracks.

Archivist can be interrogated using either of two search routines, Easy Search gives you a duplicate copy of the card, you type the variable to be searched for in the appropriate field, and Archivist does the rest.

For those requiring a little more flexibility, a complex search equation can be built up using mathematical, and Basic Operands.

Archivist of cause, also provides a Search and Replace facility, plus a fast Primary & Secondary Sort routine.

A Clipboard, allowing cut and paste operations, and a user definable Quick Entry routine, speeds up data entry into Archivist considerably.

Card Print allows printing of cards in WYSIWYG format, using of course the standard Outline fonts. (2 supplied)

Reports generator, allows your data to be presented in a tabular form. Archivist also has a specifically designed Label Printer for your Names and Addresses files.

Archivist files are saved compressed to save valuable disc space, and with a Password for privacy if required.

Archivist can automatically produce CSV files, with the option to create Graphbox headers. Also it is possible to save data as a textfile for export to DTP's etc.

Statistics window displays the Averages, Minimums, Maximums and Totals of each field for the entire database.

Archivist is able to Import files from many existing databases, on the Archimedes, as well as the BBC and PC.

Existing users can upgrade to Version 4.40 for just £5, by returning the original disc.

£29.95 INC

TECHNO TECHIE

Computers have transformed today's music scene and, in part two of our practical music series, we bring you our first case study; the dance addict

Steve Marshall is 17 years old, likes dance music and wants to get involved in the latest dance craze by making his own music . . .

'Dance music is really my thing – my current faves are The Shamen and The Orb. I've been into the dance scene for some time now and I reckon I know these sounds inside out.

'I know most of this music is produced by computers and I want to start using my A3000 to create something similiar. Techno sounds are what I am after, with thumping drum beats, lots of weird samples from old records and a few cheesy piano riffs thrown in.

'I can sort of use a keyboard, but I know nothing about music or score reading. My machine is a 2Mb A3000 and I think I also need a drum machine. I've got about £400 to spend.'

DOING IT

Since dance music is very rhythm-orientated this is the main influence on Steve's purchases. He will definitely need a keyboard and a drum machine. Although many keyboards come with built-in drum sounds, the complexity of modern dance grooves is such that it is worth having a separate unit, leaving the maximum number of sounds available to the keyboard.

He will also need a Midi interface for the A3000 and a small audio mixer to hook everything up to his hi-fi or cassette deck. Read more about our recommended setup over the page.

Once Steve has established his setup he will need to learn a few simple techniques, however well he thinks he knows the 'sounds'.

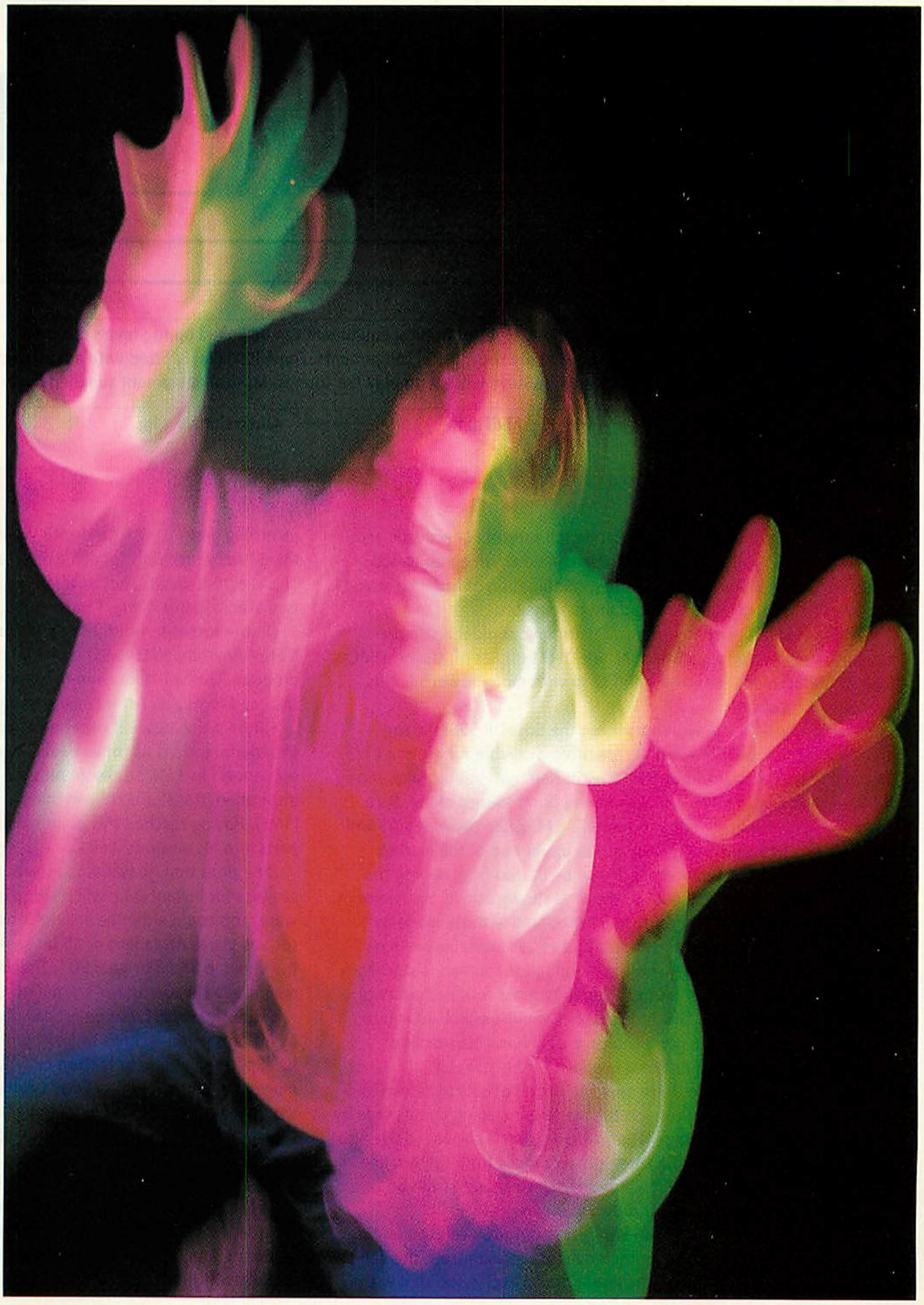
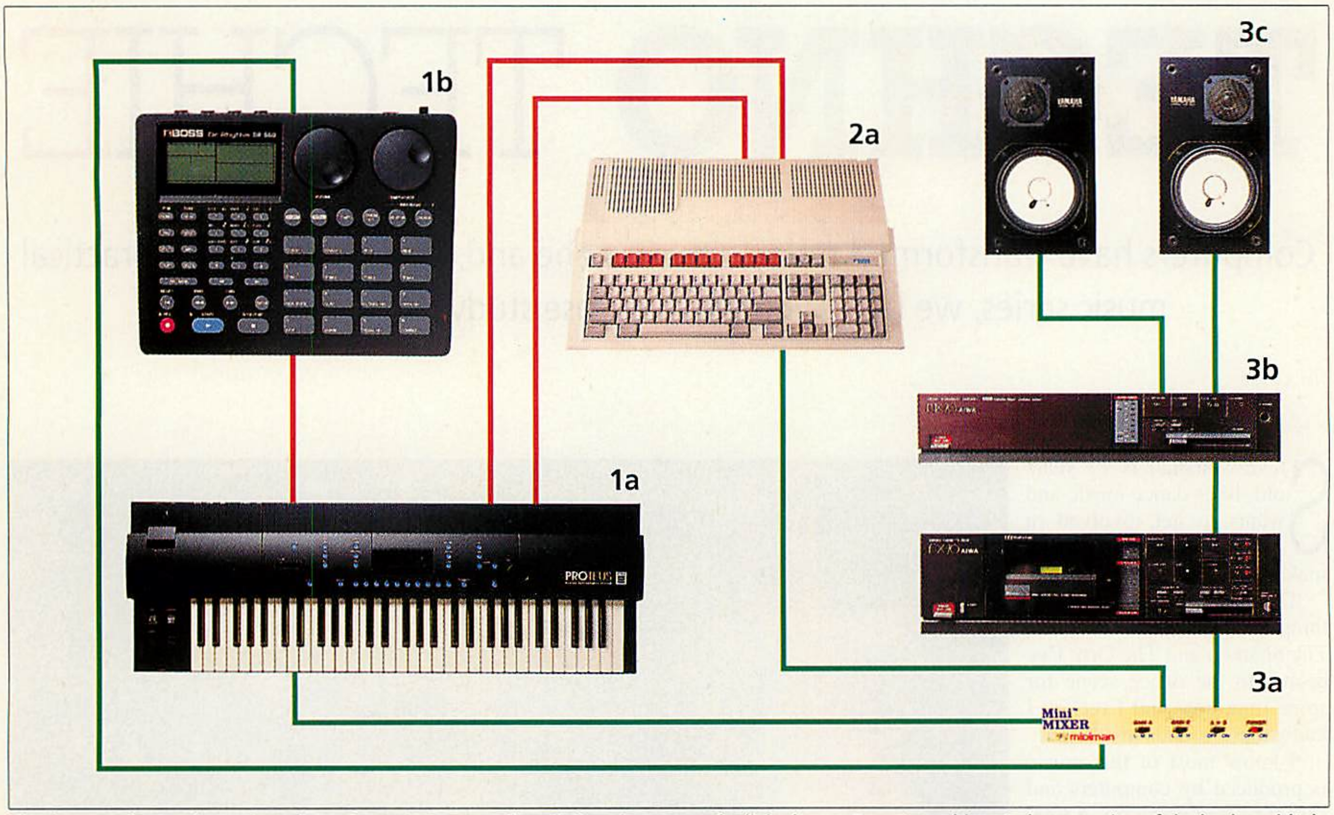


Photo: ROBERT CLIFFORD / Stylists: POLLY GORDON & KATIE CLARK / Model: PHILIP GORDON



The diagram shown above shows how the various types of musical equipment can be linked up to Steve's machine. A cheap version of the keyboard (1a) plus a drum machine (1b), and a Mini-Mixer (3a) are the musical components. The A3000 (2a) is fitted with a Midi card and uses Clare's RhythmBed to edit drum sequences. A domestic hi-fi (3b, 3c) is what Steve will use to play the sounds. Musical equipment supplied by Music Connections (071-731 5993).

COLOUR KEY: Midi data — Audio signals

BAU RECOMMENDS . . .

Midi drum machines come with 16-bit digital samples of acoustic and electronic percussion instruments. There can be anything up to 500 different samples. Most units feature a combination of drum kit sounds and hand held drums, mostly Latin and percussion.

Current fads in the dance music industry favour older analogue equipment, so recent units often include hi-fi samples of 'classic' DMCs. New drum machines start at around £250 with more powerful units available secondhand.

Notable among these workhorses are the Boss DR-550 (shown above) and the Alesis SR-16 which are often available for around £125. Strangely, it is cheaper to buy DMCs with their own in-built sequencing facilities than it is to buy a unit containing drum sounds alone. Such drum modules, 19in rack units triggered by Midi like the Alesis D5 and the Em-u Procussion, are all aimed at the upper end of the market.

Given his tight budget, Steve will also be barred from buying the nore expensive keyboards, such as the Emu shown above. His choice of Midi keyboard is limited to 'entry level' models like those made by Kawai. Although the number of notes and voices available on these devices is rather limited, they are good enough for someone starting out. A browse through the music technology press revealed a Kawai PH50 for as little as £129. This four-channel, multi-timbral, 200-voice synthesizer would make a good choice. It only has a four-octave keyboard, but this should not be a problem for Steve yet.

To connect his A3000 to these devices, he will of course need a Midi card. There are several of these on the market, including those made by Acorn, EMR, and Leading Edge. The Acorn version is about £65. He also needs a device to combine the three stereo signals from the Arc, the keyboard and the drum machine into one stereo pair that can be recorded on to tape or played through speakers.

Since he is using electronic devices whose output levels can all be controlled from the computer or their own volume controls, this can be a fairly simple unit without all the knobs and sliders associated with recording desks. One such device would be the 8-into-2 Midiman MiniMixer which sells for £85 from Zoan Distribution (071-738 5444). This is a 'hi-fi' device, but an even cheaper way of doing this is to buy two StudioSpares 4-into-1 passive mixer/splitter boxes (£6.90 each).

On the software front, I suggest Steve starts out with a drum editor. Clares' *RhythmBed* (£49.95) is an excellent example of this type of program. This will allow him to experiment with drum patterns over Midi and to trigger Arc internal samples in time to the music.

Future purchases will depend on the direction his music takes as his experience grows. As funds allow, he could later move up to a full sequencer like EMR Studio 24 plus v.2, Clares' Serenade or Pandora's Inspiration, transfering his rhythms to them via Standard Midi Files (SMF). Having reached this point he will be able to incorporate synth parts into his music as well.

If he finds that he wants to incorporate his own sound samples (TV samples for instance) he will need to invest in the appropriate hardware. This could either be an eight-bit sampling interface and software such as Clares Armadeus or 16-bit samplers controlled by Midi such as the Cheetah SX-16 or Akai S01. The internal option is an order of magnitude cheaper than external units but offers lower quality.

Seriously powerful samplers can give dance grooves a human quality by lifting several seconds of 'real' drumming from a favourite record. If he expects sampling to feature heavily in his work, he can save a little money by buying Leading Edge's combined eight-bit sampler/Midi. This sits in the machine's Econet socket and leaves the podule socket free for other things but there are compatibility problems with a few music programs, so check before purchasing.

Or, if Steve decides that he wants more sound sources, there are several options such as sample players that generate quality 'pre-recorded' sounds. Or he could look at analogue modules. A cheap source of analogue, digital, and sampled sounds is the Evolution EVS-1 module which can be found for £199.

TECHNIQUES

Rhythm is built up according to a stated or unstated pattern. At the heart of every rhythm is a 'pulse'. This is a continuous beat that you tap your foot to, and this is what defines the speed or 'tempo' of the tune.

When writing computer music, pulse is defined in metronome marks or beats per minute (bpm). Most dance music is between 105 and 120 bpm; anything faster calls for serious aerobics.

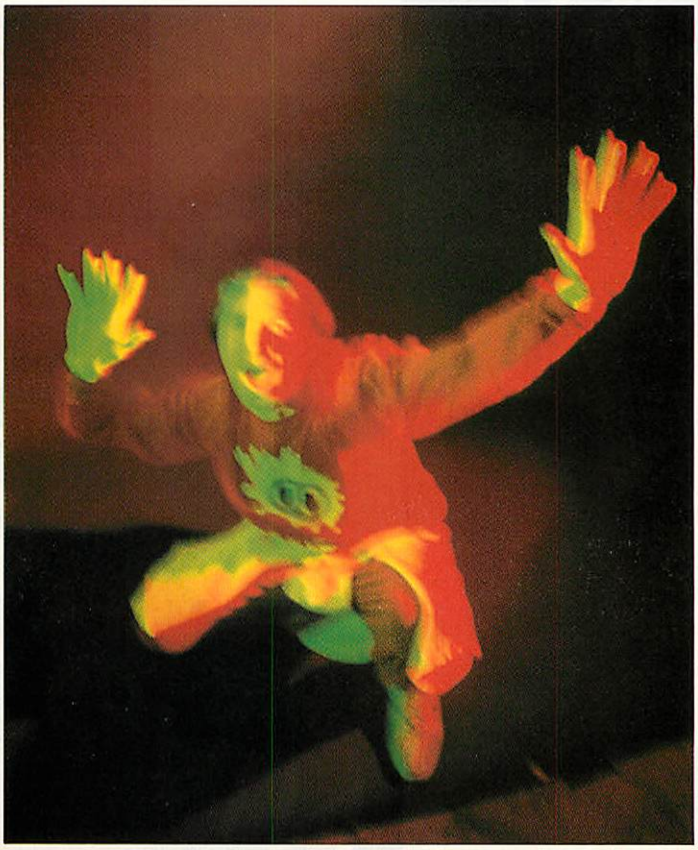
Having defined a tempo, the next element that makes a rhythm is its 'metre' (time signature). This is a way of emphasising particular pulses to form small repeating groups called 'bars'. Usually, the first pulse in the group stands out from the rest. Most contemporary music is in common time which goes 'ONE-two-Three-four'. As well as grouping beats you can also subdivide the pulse, usually by three or four, to produce 'offbeats'. This means that, in a drum pattern, a bar can consists of 12 or 16 moments in time for a 'percussion event' to take place.

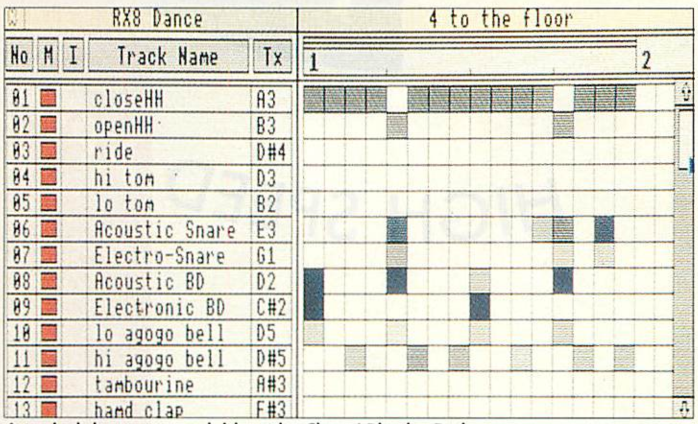
Common practice is to show a one or two bar as a grid where each drum beat is shown by a dot at the intersection of a vertical time line and an horizontal instrument line. This notation has become so accepted that you can now buy books full of example patterns, such as the *Drum Machine Rhythm Dictionary* by Alfred Publishing. Many DMCs display this format on LCD but readouts are too small to show long or complex patterns and because of this, programs called 'drum editors' have evolved to move the process to the 'big screen'.

Drum editors are either stand-alone programs (Clares' *RhythmBed*, ESP *Rhythm Maker*, EMR *Rhythm Box*) or edit options within larger sequencers (EMR *Studio 24+*). Such is the pattern making nature of the human mind that if you listen to any short group of sounds repeated for long enough, it is eventually made into a rhythm, with a specific metre that starts at a particular point in the cycle.

Producing a strong rhythm is about defining the number and position of pulses that create the pattern and, especially, where the first beat is. Prince calls this 'getting up on the one'. When hip-hop and rap started out, drum machines were very basic instruments, much frowned upon by 'serious' musicians for excessive repetition and lack of expression.

Modern dance enthusiasts exalted these 'shortcomings' by attempting to produce precise rhythms that, although they repeat every eight beats or so, have so much going on in them that, you're still listening to new bits of the pattern as the song progresses to its end. Much of this is done by 'doubling', that is, playing several instruments on each beat. And now here are some tips for making dance music:





A typical drum pattern laid out by Clares' RhythmBed

- The loudest and/or lowest instruments set the pulse and it is usually the bass drum that tells us where the 'one' is. If you don't have a bass drum or something equally strong on the first beat but do have it elsewhere, the listener will probably move the one to that point in the bar.
- Different feels can be produced by subdividing the cycle into 8, 16, 6 or 12 sections. This is usually done with a high thin sound like the closed hi-hat. Different emphases can be produce by breaking up the closed hi-hat with open hi-hat or other cymbals.
- Unless you have a very good source of drum sounds, avoid lots of bright sustained sounds – cymbals – as these are most obviously digitised and can be unpleasant.
- Double similar instruments to make them more impressive, for example using synthetic snares with real snares, low and synthetic toms with bass drums (The Shamen) and so on.
- Double instruments with different sounds to draw attention to them, for example using a quiet tambourine on every bass drum beat.
- Tinkley bits: use other instruments instead, or as well as, closed hi-hat/open hi-hat to mark eights or sixteens. Check out the agogo bells in Rozalla's *Ready to Fly* or the tambourine in *Buffalo Stance* by Neneh Cherry/Wild Bunch.
- Use quirky variations and produce different versions of the main pattern with different tinkley bits. Try using two similar drum sounds for one drum all the way through the track but vary the volume of one relative to the other to give subtle variations in tone, without significantly altering the volume.
- If you have a sequencer with sufficient resolution move some sounds very slightly off the beat. For example, beats two and four played early will 'push' the beat making it seem faster, played late, they will give a lazy 'swing' feel to things.

PRODUCT DETAILS

Product: RhythmBed
Supplier: Clares
Tel: (0606) 48511
Price: £49.95 inc VAT

Product : RhythmBox, Studio 24+ Version 3
Supplier: EMR
Tel: (0702) 335747
Prices: £39.95, £249.10 inc VAT

Product: Rhythm Maker
Supplier: ESP
Tel: (0602) 295019
Price: £39.95 inc VAT
(Also on the Beeb £24.68)

Product : Inspiration
Supplier: Ampsound
Tel: (0727) 850075

IN BRIEF

A quick look at easy art and animation for schools, low-cost comms, the latest Hawk digitiser, and updates of Spark and Squirrel

IMAGINE

Topologika
Tel: (0733) 244682
£39.95



Aimed at children, Imagine has its own way of doing things

Imagine is described as an icon-free design program by its publisher, Topologika. It is in fact, a free expression art program for Key Stage 2/3 pupils (8-14 years). The blurb makes a point of emphasising that the program is non-Risc OS compliant in order to make it as easy as possible for children to use. It consists of two discs (the program and a gallery of art) and a manual.

Imagine works in 256-colour mode 15, and possesses all the expected range of functions: a variety of different brushes of varying shapes and sizes, rubber band drawing, air brush, colour fill, zoom, text, copying screen areas and the essential loading, saving and printing. In addition to these 'standard' features, *Imagine* possesses one or two more interesting ones. I particularly like the ability to manipulate two separate screens at a time and being able to copy portions of each one to the other providing a useful scribble pad on which to try out ideas. Other unusual features are a mixture of the useful and novel. A 'magic' pen, instant outlines, flips and rotations, 'brick' patterns. In addition, there are a number of mathematical functions which do broaden the scope of the program.

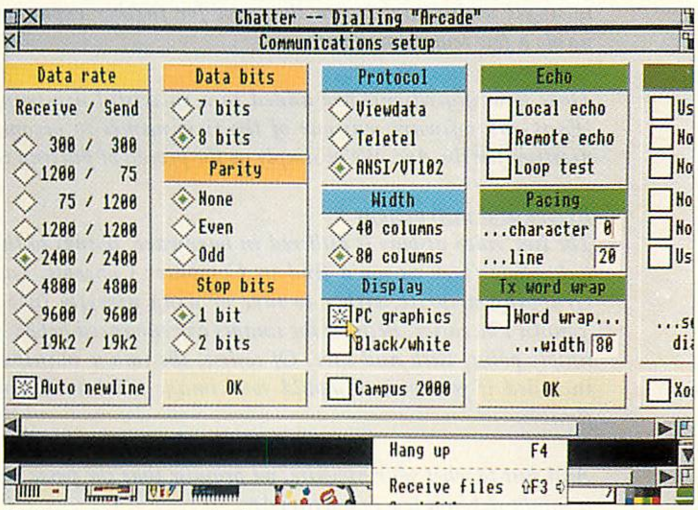
For example, it is possible to tessellate both regular and irregular polygons and there is a wide variety of symmetrical drawing effects (including eight-fold, rotational symmetry), mapping and at least nine regular and irregular geometric shapes. Unusually, there is even an elementary turtle graphics feature.

In summary, if you don't mind pupils using non-Risc OS compliant software, then *Imagine* is an accomplished program which offers an alternative approach to that of *PrimeArt*.

Chris Drage

CHATTER

4Mation
Tel: (0271) 25353
£37.50



Chatter makes comms simple

Chatter from 4Mation is a low-cost communications package to introduce beginners to the world of comms. It offers simple no-frills setup and operation, supporting ANSI/VT102 and Viewdata terminal emulations and a few popular file-transfer standards.

Even so, *Chatter* is a fully functional comms program with features usually found only in more sophisticated packages, such as personalised telephone directories, automatic logon sequences, offline message reading, and file transfer by Ascii, XModem, YModem and ZModem.

The manual is written in a clear chatty style, and explains each comms activity in turn, giving step-by-step instructions. Appendices of technical terms, bulletin boards to contact, modem wiring diagrams and an explanation of what happens during a typical dialling sequence are included.

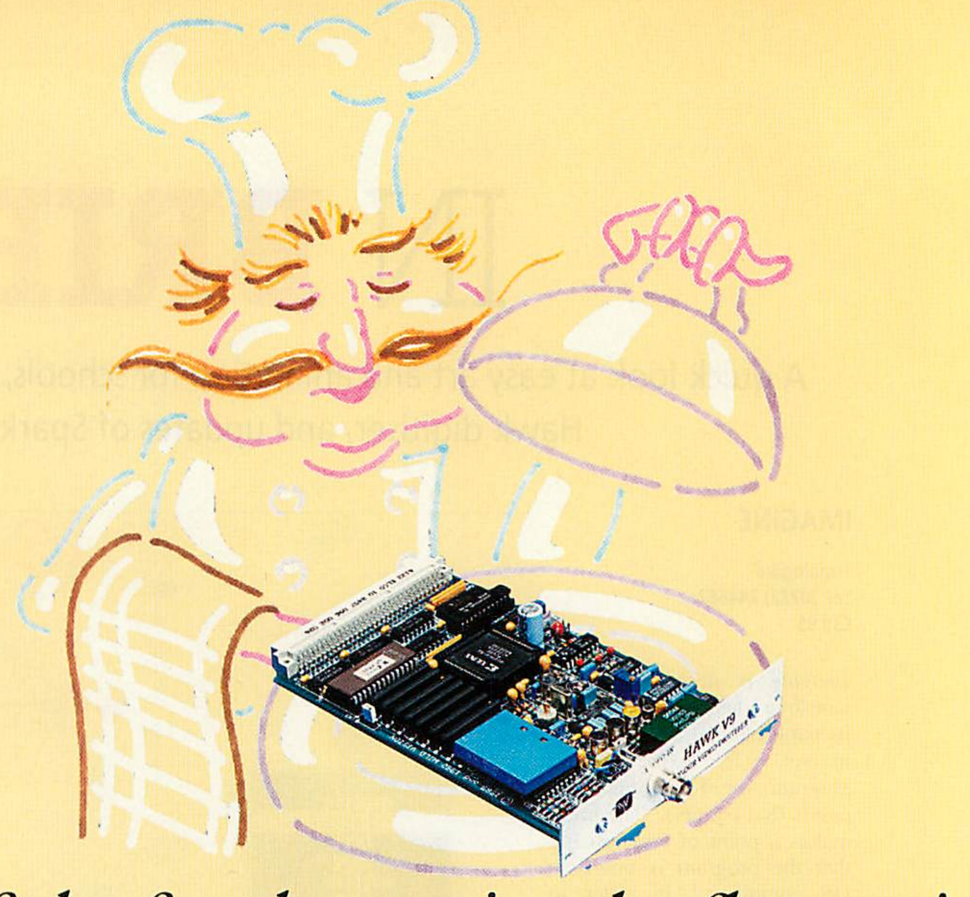
The main configuration windows for communications setup, telephone directory and modem data are cleverly designed to open, showing the major items to be set. Explanation of the use of the viewdata and Teletel terminals and their keypad windows is a little sketchy, but support for the Campus 2000 viewdata system is included. No CET transfer protocols are provided.

Testing *Chatter* online with a simple £99 2400bps Hayes pocket modem, using the default settings, gave an immediate successful connection to both Ansi bulletin boards and Prestel. The Ansi terminal works well, but does not support some effects likely to be found in use in the example BBS systems given. The Viewdata terminal doesn't support the usual "Return = #" convention, but offers an icon click to generate the # symbol. I had to press the underscore character on my A4 keyboard in order to complete a Viewdata command line.

Chatter is an ideal uncomplicated introduction to computer communication systems, and will probably get quite a few youngsters hooked. The level of useability is about right for easy understanding of the principles, while encouraging enquiring young minds to discover more about the hidden complexities of the subject.

David Dade





Half the fat, but twice the flavour!

Hawk V9 MkII

Hungry for a video digitiser? Now, the Hawk V9 MkII is what you'd call quite tasty. Deliciously clear digitised video live in a desktop window, almost like TV. Mmm mmm, the cream bun of digitisers, with only half the calories! We've slimmed the Hawk V9 MkII down to single width, giving you the space for further expansion card consumption. (We could name a few tempting morsels...).

These new ingredients are added to a successful digitising recipe. The Hawk V9 with its !FastGrab software was one of the first names to become really established as a quality digitiser for the Arc. We're simply in the process of putting the icing on the cake.

Recipe and instructions

The live video display is dithered in hardware, thanks to the latest programmable gate array technology (such as you'd find in Computer Concepts' LaserDirect and Scan-Light cards). Grabbing a sprite, either to save or drag directly into another multi-tasking package couldn't be easier. Because the images are enhanced before reaching the screen, it is possible to simply point, click and save. Of course, the image manipulation routine ChangeFSI is still included if you wish to mould your image further. The whole process is fast, friendly and flexible.

And just to whet your appetite, we promise that the price won't make you throw up (although it might sicken a few competitors!).

Go on, Tuck in!

WILD VISION

15 Whitney Way, Boldon Business Park
Boldon Colliery, Tyne & Wear NE35 9PE
England.
Tel: 091 519 1455
Fax: 091 519 1929

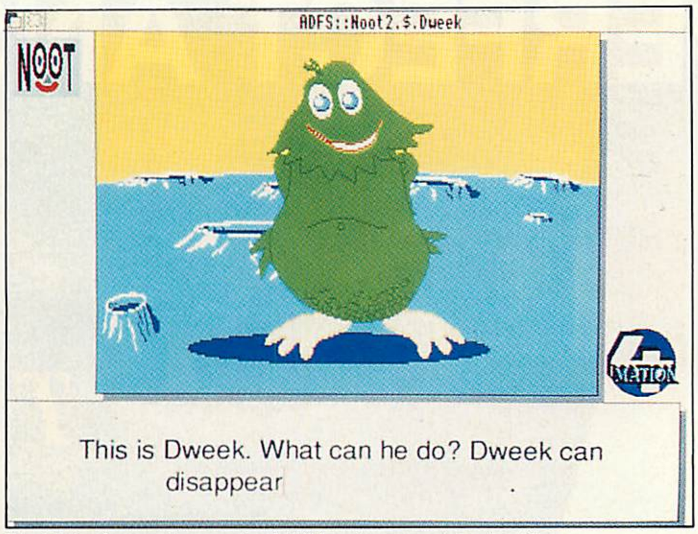
NOOT

4Mation
Tel: (0271) 25353
Price: £45.00

Various animation programs have appeared for the A-series. However, none of these can quite match *Noot* and *NootPad*. *Noot* is primarily intended for Key Stage 2 children while *NootPad*, the accompanying creator program, is intended for use by older pupils and adults. The package comprises six discs of applications, animation files and tunes and an well illustrated handbook.

The six animation files that accompany the package are a real treat, admirably demonstrating what can be achieved with *NootPad*. In *Playroom* ten toys can be brought to life by entering the appropriate word; *How It Works* is an impressive set of animations demonstrating how various common devices work.

Similarly, the *Power* file demonstrates the working of various engines and motors. *Farm* resembles *Playroom*, in that there are 14 animals and seven farm scenes to be discovered, with accompanying music and sound. For younger children the gem is *Dweek and Dweep;* two friendly aliens. If you remember *Podd* (ESM) then Dweek and Dweep could be regarded as 'super Podds' who respond actively to verbs.



Noot introduces primary school children to computer animation

Noot files are created with *Nootpad*, the editor program using *Draw* files as source pictures, *Nootpad* provides a good number of options to control the way in which the picture is animated. With *NootPad* you can be virtually 'artistically-impaired' and still create little masterpieces. *NootPad* uses *Draw* files from virtually any source; for example, *Draw*, *Vector*, *smArt*, *Picture IT* and so on. Indeed, *smArt*'s *smArtoons* and *Animals* packs were developed with animation in mind.

Creating even quite complex animations from the notebook style window is not difficult thanks to *NootPad*'s design and sensible range of features, The well-illustrated manual provides a detailed tutorial to get you started. All the work is done using a 'notebook' window and the animation with its accompanying music, text and trigger word list is assembled from 'page' to 'page' in the notebook.

These working windows are both stylish and cleverly constructed; you never become lost as all you need do is 'thumb' back through the notebook to a familiar 'page'; a neat concept. One point to keep in mind though, is the large size of source files; a hard disc is really necessary for this type of work. Once in *Noot* file format, all data is compressed, so using floppies presents few problems.

NootPad is a tad too complex for primary school children, although it has real possibilities in the home. It is better suited to secondary pupils. A demo disc containing examples of the animated files is available from 4Mation; just submit a blank disc.

Noot and *NootPad* combination provide a whole new artistic dimension for investigation and, despite there being little or no mention of IT in the new National Art Curriculum, they fulfill the requirements for communicating information (Technology AT5) extremely well.

Chris Drage

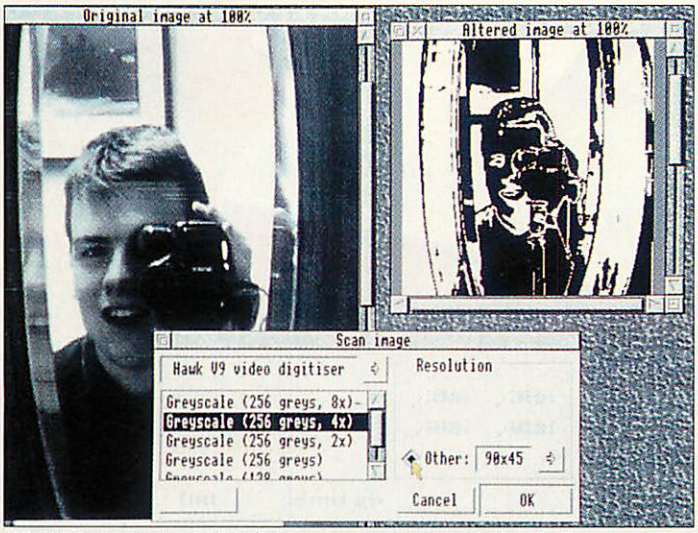
HAWK V9 Mk2

Wild Vision/Computer Concepts
Tel: 091-519 1455/(0442) 63933
Price: £269

The Hawk V9 Mk2 colour video digitiser from Wild Vision is one of the latest products of the company's tie-up with Computer Concepts last year. Xilinx's programmable gate array chipset, much favoured by CC for its own hardware designs, has been used by Wild Vision to halve the size of the original V9 card to a single-width podule.

Initial supplies of the Mk2 card have been accompanied by software that is related to the older card but we've had an exclusive look at brand-new software for the Mk2 produced by CC, which should be released shortly.

Hardware improvements mean that the V9 Mk2's framestore handles 15 bits per pixel (bpp) images instead of 12bpp. If you have a suitable enhanced video graphics adapter, like CC's own Colour Card, which can display Clear File format images, the result is much smoother tonal gradation of colours.



Wild Vision's Hawk V9 Mk2 digitiser means more bits to the pixel

As the hardware can effectively be re-programmed courtesy of the clever Xilinx chip, variable real-time hardware dithering is now possible. Beyond this, the hardware function is much the same as before, except in a much smaller and more versatile package.

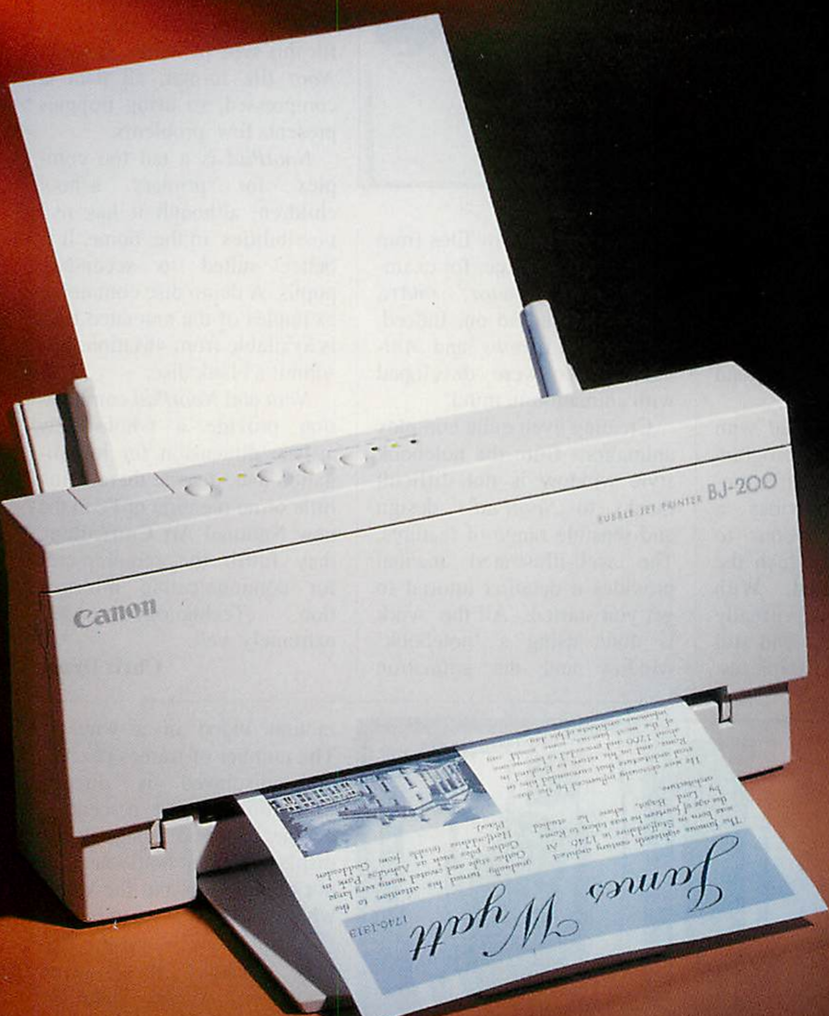
CC's new software support includes the very good ScanLight Plus image processing application with a dedicated driver for the Hawk V9 card. Linked to this is a new Risc OS-desktop compliant real-time capture utility which effectively displays full motion video in a window. The number of frames per second displayed is directly proportional to the percentage of the captured image being displayed. The bottle-neck is not the desktop, but the somewhat slow 16-bit Acorn bus.

A full frame real-time display manages about seven frames per second. Since the display routine only grabs what it needs from the V9's framestore, if you reduce the proportion of the image displayed by trimming it with the window sliders or obscuring it with another window slightly, the frame rate goes up and action becomes less jerky. By displaying as little as a quarter of a frame the rate goes up to a relatively smooth 14fps.

The V9 Mk2 is an extremely capable professional-quality video digitiser which must be at the top of the list for serious work in this field. The new software will be available free of charge to existing V9 Mk1 users as soon as it is available.

Ian Burley

THE PERFECT ANSWER



The BJ-200 is a brand new black and white printer from Canon, the market leader in inkjet printing. This is a high speed, high resolution printer ideally suited to the Archimedes range of computers.

Computer Concepts supply the BJ-200 with a special version of their TurboDrivers - the fastest printer drivers available for the Archimedes. The printer also includes a built-in 80 page sheet feeder. The price for the printer with TurboDrivers is just £299 + vat (+p&p) - a full £100 less than the recommended retail price.

At 360 dpi the BJ-200 offers significantly higher resolution than other 300 dpi inkjet printers and at faster than 1 page per minute for a full page of graphics (or 3 pages per minute for plain text) it is also faster than other printers in its price range. And being an inkjet it is whisper quiet when printing.

RISC OS Turbo DRIVERS

The BJ-200 with TurboDrivers is the perfect answer to those users seeking the best quality prints in the least possible time, without going to the expense of a laser printer. In fact we guarantee this is the fastest high quality printer available for less than a laser printer, or your money back.

Price
£299 + £10 p&p + VAT (£363.07 inc)

Speed comparison table

Comparison print times using Acorn printer drivers with a Deskjet500 against TurboDrivers with a BJ-200.
All times are in seconds shown on the ARM3 and ARM2 based computers.

To print a 4 page document consisting of a spread of different fonts, text sizes and graphics:

	DeskJet 500	BJ-200	Speed increase factor
Time to get control back - ARM3	313	59	5.3
Last page completed - ARM3	316	200	1.6
Time to get control back - ARM2	832	155	5.4
Last page completed - ARM2	834	232	3.6

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OR FAX YOUR ORDER ON 0442 231632

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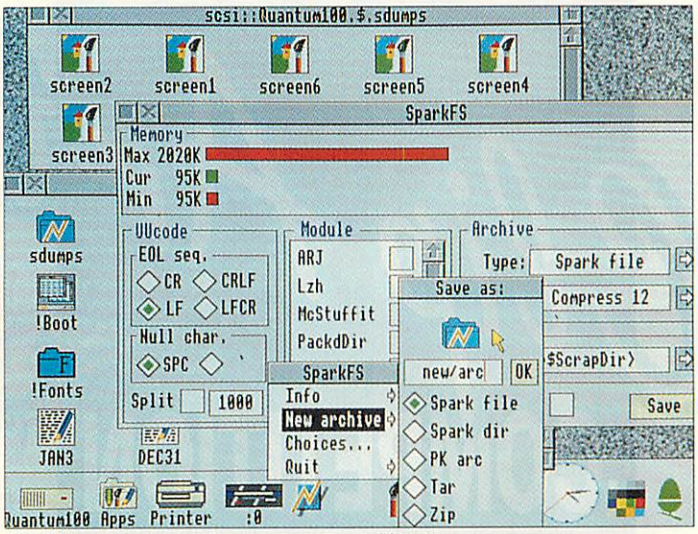
SPARKFS

David Pilling
PO Box 22, Thornton Cleveleys,
Blackpool FY5 1LR
Price: £23.96

The fight to save precious storage space on floppy and hard disc drives is a continuous struggle. When Risc OS first arrived, David Pilling was quick to produce a versatile file compression and archiving utility called *Spark*.

This compresses files, saving 50 to 60 percent space with text files or even more with bit image files, and stores them in a single encapsulating archive file. The public domain decompress-only version of *Spark* is called *Sparkplug*, and must be one of the most freely distributed third-party applications around.

Spark is great for squeezing lots of files into one easily handled archive file, but there are other file compression solutions like Computer Concepts' *Compression* and *ArcFS* (a package that is now distributed by Software 42) that are designed as filing systems in their own right. This means that squeezed *Compression* or *ArcFS* files can be operated just like ordinary files. For example, these files or directories can be accessed by other programs like databases, have their attributes changed, deleted, copied, or executed if they are applications. Compared to, say, the ordinary Risc OS filing system, the main penalty is loss of speed, since files require temporary decompression to be available for many operations.



SparkFS: you get more for your money, and less in your memory

SparkFS was introduced to enable the same standard filing system operations to be carried out on *Spark* file archives. For example, if you have an *Impression* document compressed and stored in an *Spark* archive, *SparkFS* allows *Impression* to load that document for editing and save it again back into the *Spark* archive later. You do not have to manually extract the document from the archive, then decompress it; as you would need to with the original *Spark*.

Since its introduction in the summer of last year, *SparkFS* has undergone continuous development and now features a less complicated Risc OS 3-compatible image file format and better compression efficiency with the latest Zip Deflate algorithm.

Unlike *Compression* and *ArcFS*, which are limited to one compression file format, *SparkFS* has a huge range of options and will understand many compression and archive types used on other computer platforms like Unix machines and PCs.

SparkFS will be welcomed by keen fans of the original *Spark* utility, especially comms users. *Compression* doesn't archive files and while this is inevitably seen as a disadvantage by *SparkFS* users, for some it means that *Compression* is a simpler and more efficient system for manipulating individual files.

Meanwhile, *SparkFS* covers everything *ArcFS* that does, and a lot more, and has better memory management. Though, as *ArcFS* only deals with one file compression format it could be presented as a simpler alternative.

SparkFS costs just £23.96 including VAT and carriage. If you previously purchased *ArcFS* and/or *Spark* from David Pilling, you can claim £5.99 off for either or both packages, meaning that some customers are only going to part with £11.98.

Compared with *Compression* (£39), which doesn't have the overhead of archive management, *SparkFS* is a compromise, but it's a compromise that works very well.

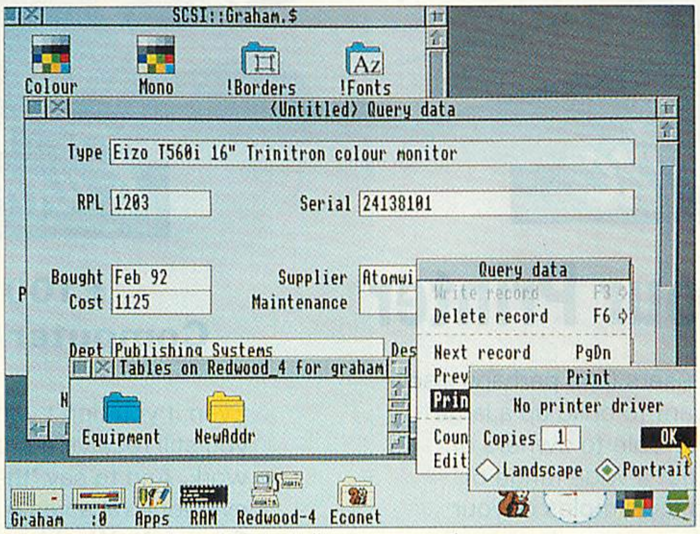
Ian Burley

SQUIRREL

Digital Services
Tel: (0705) 210600
Price: £129; Econet version: £516

Network users will be glad to know that Digital Services has upgraded its popular *Squirrel* database manager to version 1.21. There are a number of minor improvements; for example database queries are not now case-sensitive, so you can select 'Dept=Art' and catch the ones where 'Dept=art', a relief for all those whose blood pressure is raised by pedantic programs.

But the new version shows more substantial differences in the report mode: this is infinitely more flexible than its counterpart in earlier incarnations of *Squirrel*, and most of the old frustrations have been eliminated. You no longer have to re-create all your views and queries if the data is moved to another location on your disc; you can drag the new table into the Show Tables window. And you can directly edit the view, change the background colour, alter the type and so on, even after the query has been defined. You can even alter these details directly on the report layout. Drawings or sprites added to the report format are shown properly, rather than appearing as weirdly stretched icons. Many of the other changes to the program are rather minor, and are more in the nature of tidying up an already good application. But, taken together, they have transformed the useability of *Squirrel*'s reporting.



The multi-user version of Squirrel allows one central copy

The multi-user version of Squirrel allows you to keep one central copy of a datafile with several users having access to it at the same time. A Squirrel server application keeps track of the multiple accesses to the central file, and remarkably, this can work out considerably faster than the single-user version on your own hard disc.

Squirrel still lacks such useful features as bulk update of records – a sort of find and replace – or any form of programmability like Longman Logotron's *S-Base*. But for ease of use, a broad mix of features, and the cutest mouse pointer ever seen on an Arc screen, *Squirrel* still cuts it.

Graham Bell

FLYING COLOURS

Colour printing has never been easier. Malcolm Brown looks at the options

Few printers are really capable of producing a true hard copy of your Archimedes' screen display. Colour is essential, but colour printing is both expensive and something of a 'black art'. Colour printers, although rapidly rising in popularity as they become more affordable, are still a minority product.

This is not due to lack of technology. Although dot-matrix printers produce almost universally abysmal results if used for anything but the most simple of tasks, other printing techniques have evolved which can do better.

At the top of the range are dye sublimation and thermal wax transfer printers which use tiny heaters to melt coloured wax or evaporate solid dyes onto the paper. Slighly less sophisticated, colour laser printers are also finding some favour. However, these machines can cost several thousands of pounds to buy and usually about 50p a shot to use.

More useful to most Archimedes users are colour inkjet printers. These use four different inks, in black, magenta, cyan and yellow. By overprinting these inks, seven colours are produced; red, yellow, green, cyan, magenta, blue and black. Other more subtle shades are produced by 'dithering' or using 'halftones' to lighten the hue and mix the primary colours in varying proportions to produce natural colours. Both methods rely on printing small dots of colour in a pattern to produce the effect.

A colour inkjet printer needs a printer driver. There are many of these available, and which you choose depends on the control codes used by the printer. Most use the codes developed by Hewlett Packard for the first Paintjet printer but others use Epson's LQ dot-matrix printer codes.

The standard HP or dot-matrix drivers supplied by Acorn will not work in colour, but suitable drivers are available from Computer Concepts, Risc Developments, Ace Computing and others.

Most of these allow only eight-bit colour printing in just 256 colours; the most the standard Arc can display. But many applications deal in 24-bit colour so, for more realistic work, 24-bit drivers should be used. Computer Concepts and Ace both produce these.

Also needing consideration is the paper you use. Each printer manufacturer recommends its own special inkjet paper. Plain cartridge paper can be used, but specially coated paper gives the best results. It is well worth investing in some for your final prints. Colour inkjet printing is still new and improving all the time, but several capable machines are now available for reasonable prices.

The favourite in the past has always been the Deskjet 500C (reviewed in detail in *BAU* in February 92) but now that machine has a few pretenders to its throne.

CANON BJC-800 + CC TURBODRIVER

Price: £1895
Resolution: 360dpi
Max paper size: A3
Approx cost per page: 15p

The BJC-800 is widely accepted as the most sophisticated colour inkjet printer available today.

Although it is capable of printing A3 paper, the BJC-800 is not large; about the same size as an A5000. The cover folds down at the front to hold about 50 sheets of paper. Only cut sheet paper can be used.

Unlike all the other printers looked at here, the BJC-800 does not have combined printhead/reservoirs. Instead the printhead remains in the printer while replaceable ink cartridges slot behind a flap at the front. Replacement cartridges are expensive, so the overall cost per page is not the cheapest around.

The BJC-800 can produce print at an impressive 360dpi. Such fine resolution also means that graphic images made up of half-toned shades and dithered combinations still end up looking reasonable.

This printer uses Canon's own codes and the Epson's LQ standard but, unusually, it cannot be used with a normal Epson dot-matrix printer driver. Instead, for use with the Archimedes, it requires a special driver and cable supplied by Computer Concepts. Most importantly for this kind – and price – of machine, the TurboDriver produces full 24-bit colour prints. *Paint* does not produce proper 24-bit colour print output, so *Paint* files should be dropped into *Draw* for printing.

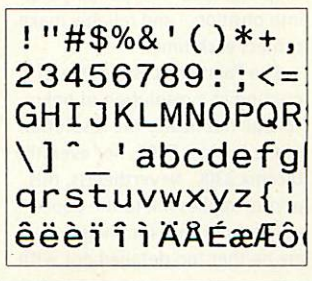
The results are excellent. The BJC-800 produces exceptionally even areas of colour, and the fine detail allows realistic reproduction of even photographic type images.

This does need a hard disc or a good amount of memory – 4Mb is handy – but for anyone considering spending this sort of money on a printer, that is unlikely to be a problem.

For colour proofing or limited runs of full colour DTP work at anything like this kind of price, nothing else will touch it.







KODAK DICONIX 330C

Price: £749
Resolution: 192dpi
Max paper size: A4
Approx cost per page: 13p

This printer is effectively four monochrome printers in one. Four separate printheads are positioned next to one another, each one of which has a meagre 12 nozzles each.

Using four completely separate ink reservoirs gives the best use of ink with no wastage, hence the low cost per page. But, although the 330C is capable of remarkably good quality output, this is difficult to achieve because of the crude mounting of the printheads. This relies on a simple spring and clip mechanism to hold each printhead cartridge in the correct alignment and in electrical contact, with the signals driving the inkjets. When the Diconix's ink cartridges are replaced, it is largely a matter of trial and error to install them properly.

Running a few test prints showed up all these problems; multi-toned pictures are limited in detail, due to the chunky dithering produced and the poor registration. And when printing simple text, the mere 12 nozzles really take their toll on the print quality that is possible.

There are three print modes: draft, NLQ and quality. Both draft and NLQ are pretty appalling. Only the quality mode could even be considered for letters and this is very slow, at a measured speed of just 22cps.

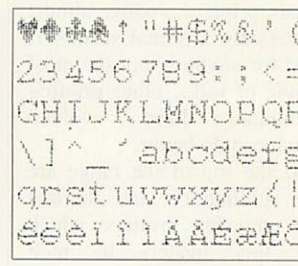
The 330C can print only across an A4 sheet, but it is much wider than most A4 printers because the four printheads sit side by side but must all reach both sides of the paper. It uses both cut sheet and tractor fed paper with a small – about 50-sheet capacity – sheet feeder built-in.

Kodak's own control codes are used along with the same Hewlett Packard Paintjet codes used by the Deskjet 500C.

The Diconix 300C's paper handling is good and, potentially, this printer makes a reasonable all-purpose machine for text and colour graphics, but it is let down by the poor design of the printhead mounts and the allocation of too few nozzles to each printhead.







HEWLETT PACKARD PAINTJET XL

Price: £1950
Resolution: 180dpi
Max paper size: A3
Approx cost per page: 20p

The Paintjet XL is a huge machine; it's nearly 30 inches across, and deep and high too. It uses just cut sheet paper (up to A3 in size) and a small bulk sheet feeder is built into the base of the machine to automatically supply paper as this is required.

This is a thermal inkjet machine, and it uses four separate printhead/reservoirs which are arranged on a single moving carriage. The printhead cartridges are simple to load – they simply clip into position – and reliably make contact each time.

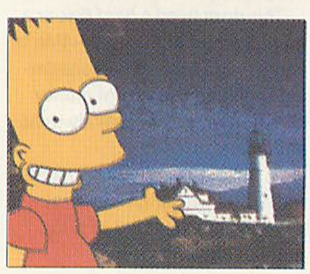
The Paintjet XL is capable of printing at a resolution of only 180dpi; not nearly the resolution of the Deskjet 500C, nor even the Diconix 330C. Nevertheless, this printer applies ink to the paper very evenly and, for images that are neither too detailed nor with too many subtle colours, the results are excellent.

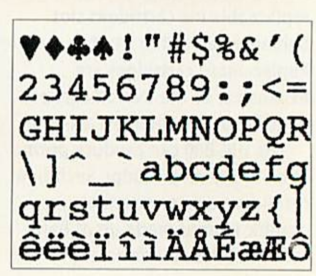
Special transparency and presentation modes perform a two-pass print that can be used to produce extemely vibrant colours for overhead display slides and report pages. Alhough largely designed as a graphics printer – naturally it uses the HP Paintjet codes – the Paintjet XL also produces text in the normal way too. Courier and Letter Gothic fonts are available in an extremely fine NLQ. There is little difference between the text from this machine and that produced by a laser printer.

The Paintjet XL is fast. It manages a speedy 85CPS printing text and for producing graphics it is about three times as fast as the Diconix and about five times the speed of the old Deskjet 500C.

Within the limitations of its resolution, the Paintjet XL performs excellently, producing graphics images of even depth and even excellent text as well, but this machine can only be recommended at its high price if the wide carriage and Hewlett Packard codes are essential.







INTEGREX COLOURJET 2000

Price: £795
Resolution: 180dpi
Max paper size: A4
Approx cost per page: 23p

This is an Hewlett Packard Paintjet (not XL) printer – no longer sold by HP but badged by Integrex. It uses two inkjet printhead reservoirs, one for the three primary colours and one for black. The Colourjet 2000 is much smaller than the Paintjet XL but pretty similar in design. Rather inconveniently, the power supply for this machine is contained in a separate case.

The Colourjet 2000 uses both tractor and friction feed but there is no automatic paper loading, and threading paper by hand is a fiddly business. Although the carriage width and printhead arrangement is different to the Paintjet XL, the print resolution and performance is very similar.

The Colourjet 2000 produces the same excellent quality text, close to laser print, at a slightly slower speed of 75cps; which for this quality is still racing along. Graphics use the same rather disappointingly low resolution. However, like the Paintjet XL, the quality of graphic images produced, so long as very high resolution is not an essential, is simply superb with exceptionally bright and even coloured areas.

Since the three primary colours must be printed in three passes (as they all come from the same printhead), graphics images take much longer to print on this machine than the Paintjet XL; around twice the time on average.

As well as the HP Paintjet emulation, the Colourjet 2000 also supports Integrex's own codes – as used on the old Integrex Colourjet 132 – with Risc OS drivers available. However, most users will probably stick to the HP emulation.

The high-quality – if low-resolution – output from the Colourjet 2000 is attractive. However, it is somewhat offset by the sparseness of user controls and convenience features and is really below par for this high price.





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HP DESKJET 550C

Price: £689
Resolution: 300dpi
Max paper size: A4
Approx cost per page: 13p

This is the latest version of the trend-setting Deskjet 500C. This machine uses two ink reservoir printheads – black and three-colour (magenta, cyan and yellow). It can take both black and colour ink cartridges simultaneously, instead of having to remove the black cartridge and install the three-colour cartridge when the printer is switched from text to graphics printing.

The 550C uses just cut sheet paper – and envelopes – fed from a hopper in the base to be delivered face up in reverse order in another tray protruding from the front by a complex series of rollers and levers.

Straightforward text is produced in four different styles and in two qualities. Even the poorer draft quality is excellent, and the slightly slower NLQ print is the equal of many laser printers.

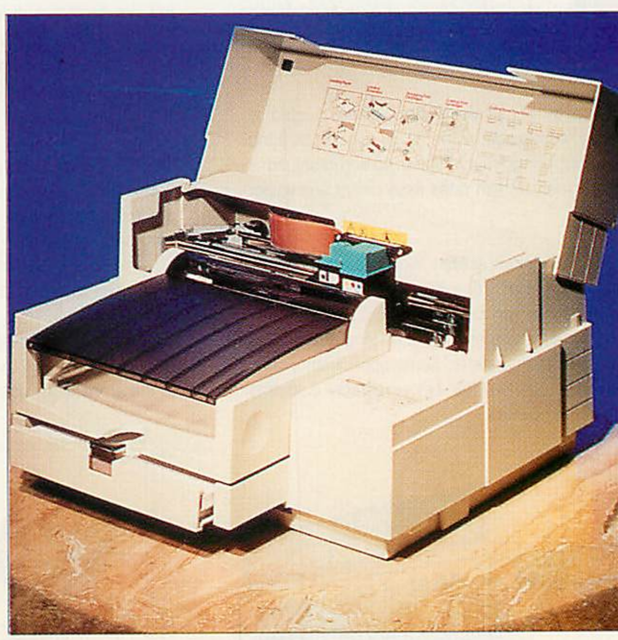
HP's Laserjet and Paintjet control codes are used for the black and colour modes respectively. The 550C manages a nippy 81cps in NLQ mode but printing graphics images is very slow; up to ten minutes for a page.

Despite holding both colour and black ink cartridges, this machine cannot produce true blacks in colour graphics. The 550C can only use one cartridge, and one emulation at a time.

Blacks in a colour image are produced by printing all three colours together. The resulting dark brown is good enough when solid but when a shade of grey is required, the difference is all too obvious.

But within these limitations the results are excellent. The resolution is the same 300dpi produced by older laser printers and although the print is not of the same quality as the Canon BJC-800, it is still impressive.

For this price, the Deskjet 550C is a highly versatile monochrome printer with the added ability to produce good colour graphics when required. However, whether the extra convenience of the latest version really makes it worth the extra money is harder to say.

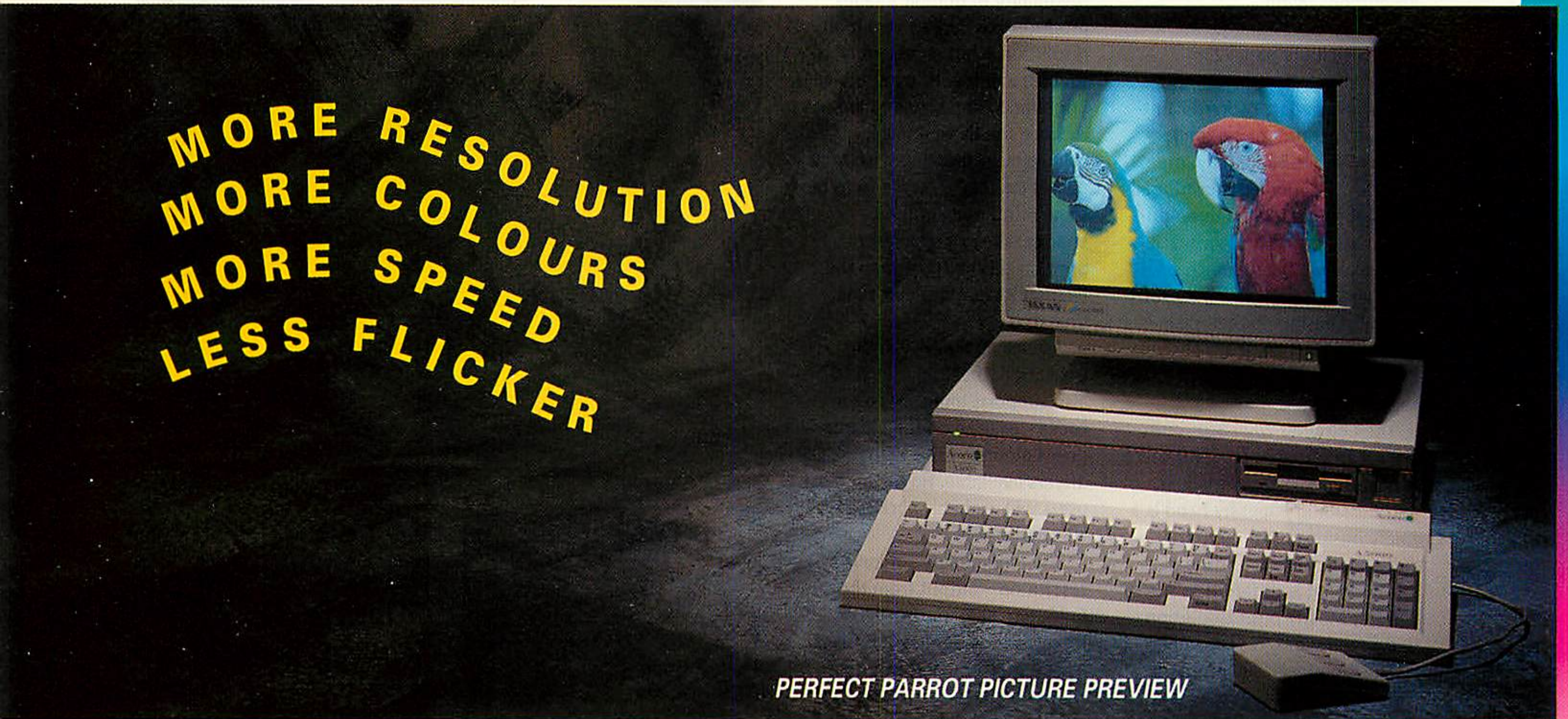




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THE ColourCard

FOR THE ARCHIMEDES



PERFECT PARROT PICTURE PREVIEW

A new graphics accelerator card for the Archimedes, the ColourCard brings a host of improvements to the video capabilities of any Archimedes A300*, 400*, 540 or 5000 series computer.

The simple to fit, single width expansion card is completely compatible with all RISC OS desktop software, but brings much higher screen resolutions at higher screen refresh rates (less flicker and easier on the eye).

In 16 and 256 colour screen modes all the colours are selectable from 16 million hues. This means scanned pictures can be seen with 256 true grey-levels on screen and that you are no longer restricted to the preset Acorn palette. Some applications, such as ArtWorks, can provide better screen colouring using the new palettes.

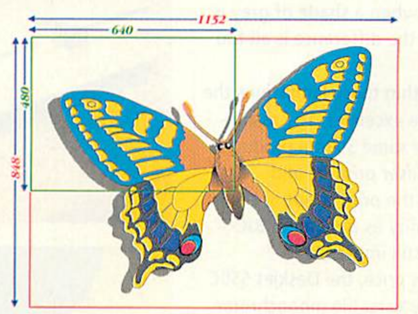
In addition, the ColourCard offers 15 bit-per-pixel true colour screen modes having over 32,000 colours on screen at once. Although these screen modes are not yet desktop software compatible, it is expected that programs will become available that take advantage of the modes. The ColourCard is supplied with a 24-bit preview utility to show 24-bit Clear files in stunning full colour.

The ColourCard reduces the load on the main Archimedes memory and so allows the ARM processor to run much faster than would normally be possible in high resolution screen modes. Depending on machine and screen mode, graphic operations can be up to twice as fast.

The ColourCard revolutionises DTP and graphics work, and opens up the world of true-colour graphics to the Archimedes user for the first time.

SOME OF THE SUPPORTED SCREEN RESOLUTIONS

Colours	Resolution	Refresh
16 colours	1600 x 600	65Hz
	1024 x 768	72Hz
	1152 x 848	64Hz†
	1280 x 512	80Hz
256 colours	800 x 600	85Hz
	1152 x 424	80Hz
32,000 colours	800 x 300	80Hz
	576 x 424	90Hz



ColourCard offers 3 times the pixel area of standard Acorn VGA mode 27.

The ColourCard has been developed and is backed by the largest and most successful Archimedes developer. It is available now, and for added peace of mind comes with a 14-day, no quibble money back guarantee.

KEY COLOURCARD FEATURES:

- Version 1.1 now supports 32,000 colour card screen modes
- Video pass through for guaranteed compatibility with all software without having to unplug your monitor
- 15 bpp (ie 32,000 colour) screen modes
- No quibble money back guarantee
- A3000 version now available
- New configurable screen update speed

*(The ColourCard is compatible with all multi-scanning monitors. †Only higher scanning rate monitors can manage 1152 x 848 resolution. Lower scanning rate monitors may display some resolutions at lower refresh rates. *A300 and early A400 computers may need an additional Genlock connector to be fitted internally.)*

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Computer Concepts Ltd

Gaddesden Place, Hemel Hempstead, Herts, HP2 6EX
Tel: 0442 63933 Fax: 0442 231632

E&EO Details are subject to change without notice.

Want your machine to hit the ground running? Sarah Burns says it can be arranged

ABSOLUTE BEGINNERS



Anyone with Risc OS 3 will have noticed something called *Configure* in the applications window. You can use this to change your computer to suit your needs, whims or whacky personality, your choices will remain, even if you turn the power off . . .

FLOPPIES



With Risc OS, your computer can support up to four floppy disc drives. Let your computer know how many drives it's connected to by clicking on the arrows in the floppies box. Every drive you have will be represented by a floppy drive icon, but make sure you select the correct number. Click on OK to save.

HARD DRIVE



Firstly find out what sort of hard drive your computer has. There is a choice of three drives in the hard disc drive window; ST506, IDE or SCSI hard drive. Your computer can support only one type of hard drive but several of that type; you may have up to two ST506 discs, up to two IDE hard discs and up to four SCSI hard drives. Again, the number of hard drives you have will be represented by picture icons in the window.

PRINTER



If you have a printer, the computer needs to know how it has been connected, either via the parallel port, serial port or network. The parallel port is the easiest to connect the printer to and provides a high speed connection.

Serial printers are uncommon these days, and the serial port is usually found connected to a modem (so don't worry about it).

SOUND

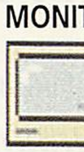


To configure your computer so that it makes the loudest, most irritating sound, likely to disturb lots of people, click on the sound icon, creatively represented by a bell. This is the sound that will scream after mistakes.

There are nine beeps and percussion sounds to choose from, which are selected by clicking on the arrow keys. Volume can be distressingly loud or turned down to a pathetic whimper.

It's also possible to turn the computer's own loudspeaker on or off. If you choose to turn it off, you will only get the vibes through headphones or a loudspeaker plugged into the computer.

MONITOR



When it comes to monitors you can choose from six types: normal, multiscan, VGA, Super VGA, high-resolution mono and LCD. Select the monitor that you actually have, not the one that sounds best. Multiscans are the most flexible of monitors as they have a wider range of screen modes. If your computer is truly clever, it will automatically detect monitor types. Click on type detection to find out . . .

Modes alter the size of the desktop display and the number of colours the desktop can display. Risc OS 3 has a number of different modes. If your knowledge of screen modes is minimal be thankful, for your computer can automatically pick a mode compatible with your monitor.

The fixed icon bar at the bottom of the screen makes the Arc more susceptible to screen 'burn' than many other machines. Flames will not suddenly burst forth from your monitor, but the chemicals that emit light are a vital part of your screen that can eventually wear out (they sort of get bored with displaying the same image all the time).

Their revenge is that, when you turn the monitor off, the image of the icon bar will still appear faintly. To prevent this, use blank delay. The screen will blank out for a few seconds at chosen regular intervals. Keep this in mind for 1 April . . .

FONTS



On to the font box. Anti-aliasing sounds off-putting and complicated but all it does is to improve font quality.

It shades around the shapes' jagged edges and makes it far easier to read, giving a clearer definition of the letter. You can choose a size limit on anti-aliased fonts. The larger the font the less it needs anti-aliasing.

WINDOWS



Risc OS 3 has very user-friendly windows. You can arrange to carry on using the desktop while files are being copied by clicking on interactive file copying. Files will be copied faster without this on, but it means you can't do anything else (for the technically minded; 'multitask').

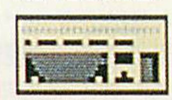
MOUSE



If your mouse pointer flies uncontrollably across the screen, consider altering the mouse speed. Go to the mouse box. There are five speeds to choose from between slow – and it is painfully slow – or super fast. Remember, the faster the speed, the quicker the pointer will move. When you hold down the mouse button to move a directory or drag something across the screen, you have to hold it for a while before the computer is ready to carry out the move.

With drag delay you can change this time. If you're impatient then pick a faster or higher number. You can also alter how far the object must be dragged before the computer realises that dragging has begun.

KEYBOARD



The keyboard box is a very straightforward option. All that's here is Auto-repeat and Caps Lock. If you prefer to type continually in block capitals, it's better to configure the computer for it then leave the caps lock on.

Isn't it boring to keep pressing the full stop button when you're drawing a dotted line? This is where the auto-repeat facility is useful. You can select a time period, in centiseconds (100ths of a second) that the key must be held down for before it is automatically repeated; this is the delay rate. It's also possible to select the interval between each repeated character in centiseconds.

APPLICATIONS



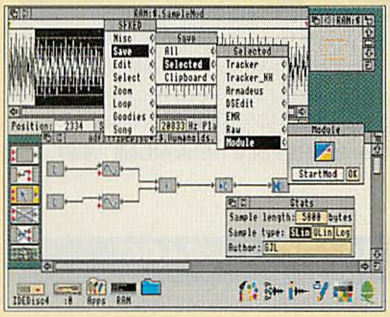
The final window, Applications, enables you to choose which applications automatically start up when you turn on the computer.

And now . . . experiment with *Configure* for a while. You won't see much if you mess about with areas like the memory and fonts so, if you're starting out, try the mouse, sound and windows so you can actually see what happens.

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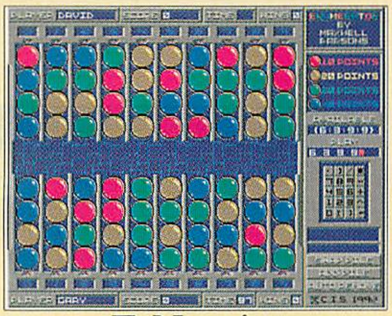
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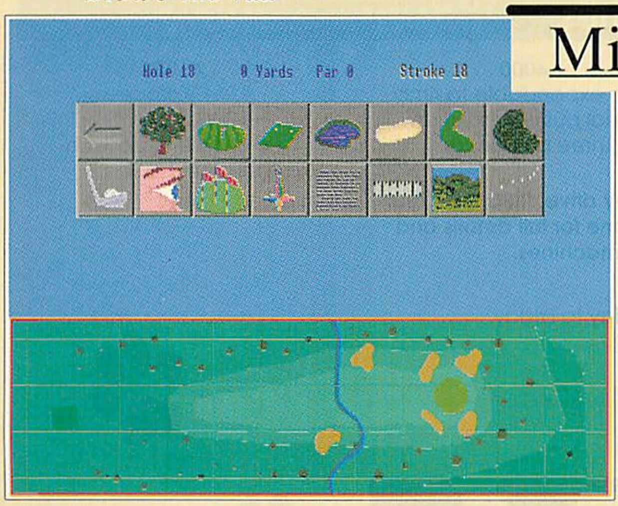
Our versions of famous arcade games.



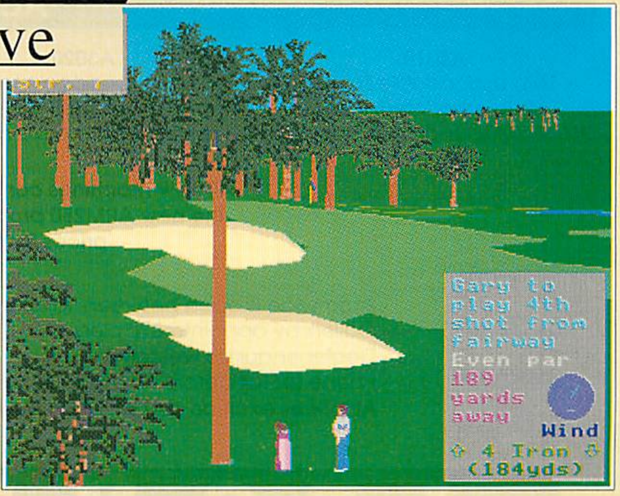
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MicroDrive







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GAME SHOW

Space. Technically, nothing at all, yet filled with mystique, excitement and potential, Captain. And of course the aliens, those bug-eyed green things with laser guns whose native accent happens to be Hollywood-American. After the Daleks it was computers which brought the odyssey to the home. Interactive alien bashing began with *Space Invaders* but, for Acorn users, it was *Elite* on the BBC Micro that brought space into their lives, or rather took them into space, and its conversion to the 32-bit Acorn machines a year and a half ago by Hybrid Software let the legend live on.

A cool intergalactic commodities trader could only become 'elite' if their market sense was matched by a deft knack for dispatching marauding pirates. It was that aspect which brought out the excitement and mystique of *Elite*,

Now a new generation of space games may well reclaim the galaxy for the Acorn Empire (see box). In the meantime, extant space games like *Nevryon* will benefit most from the new joystick interface from Leading Edge.

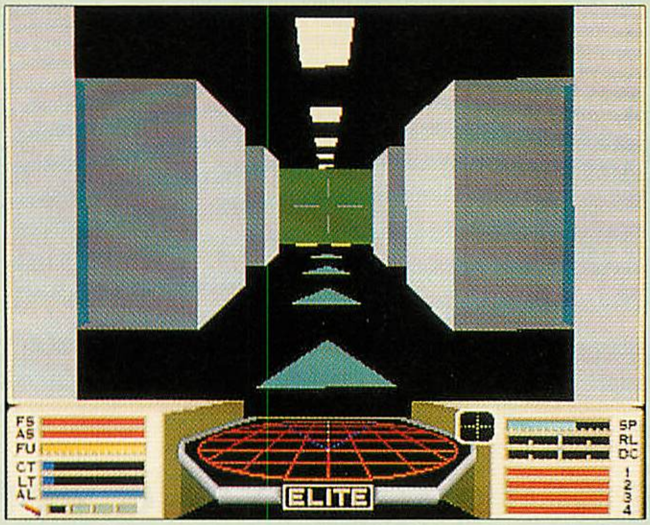
The problem up till now with Acorn's A3010 computer is that the built in joystick ports have proved stubborn with the vast majority of old games that were written before the A3010 was launched, last summer. Old games and the new joystick ports don't mix.

But now, Leading Edge has released a piece of software called the A3010 JoyMaster that arbitrates between the two, taking movement and fire signals from the joystick and passing them onto the computer as key presses, fooling it into believing the keyboard is being used to play the game.

A3010 JoyMaster comes with a library of data files for several popular games and a utility for creating more, thus tailoring the system to work with any game that has difficulty with the joystick ports. At £25.99 + VAT, the JoyMaster will be a relief to A3010 owners currently feeling miffed at unresponsive sticks.

THE FUTURE IN SPACE

The ultimate space game is perhaps yet to arrive in this solar system. But what looks promising? Recent space games include the addictive four-player Asteroids-style shoot-em-up *Spheres of Chaos*, from Matt Black Software; *Black Angel*, from the Fourth Dimension, dubbed *'The Quest for the Key to The Gates of Carrion'*, which is a space flight game a bit like *Elite* but with better graphics; and *Aldebaran*, from Arc Angels in Switzerland, a game that is so fast it has grabbed attention from all corners of the



industry. *Aldebaran* combines properly calculated interstellar travel with surface flying and combat in a small, manoeuvrable space craft.

Another recent release is *Ixion*, a real-time adventure where you have to escape from a prison planet: Earth in the future. *Ixion*, which has got to be in the running for the best game out in at least a year, is published by Software 42.

The quest for the ultimate may not be in vain. The biggest space game ever – *Karma* – is still under development, despite a mildly disappointing phase-one release just over a year ago. Watch this SPACE . . .



Technodream from Superior Software: The blockbuster sequel to the manic shoot-em-up *Nevryon* is in the wings, ready for release early March.

Krisalis Software is continuing its one-game-a-month policy throughout 1993 with another role-playing game, due out in April. *Heimdall*, published on the Amiga by Core Design, is hot on the heels of the 32-bit RPG, *Hero Quest*, but this is all about Vikings and comes on five discs. *Heimdall* shot to the top of the 16-bit charts with graphics as cute as you can get with 12th-century Icelandic warriors, and has lots of unpronounceable Nordic words.

The *Heimdall* Vikings, confused about the meaning of life – and why Tuesdays are made too far apart by the creation of an eighth day – decide to help the gods out by finding their stolen weapons in return for some Answers and here the adventure begins. And adventurous it is: axe throwing and boat fighting are just part of it and if you're looking for a real challenge, just try chasing pigs in the dark after too many pints of strong ale.

NEWS NUGGET

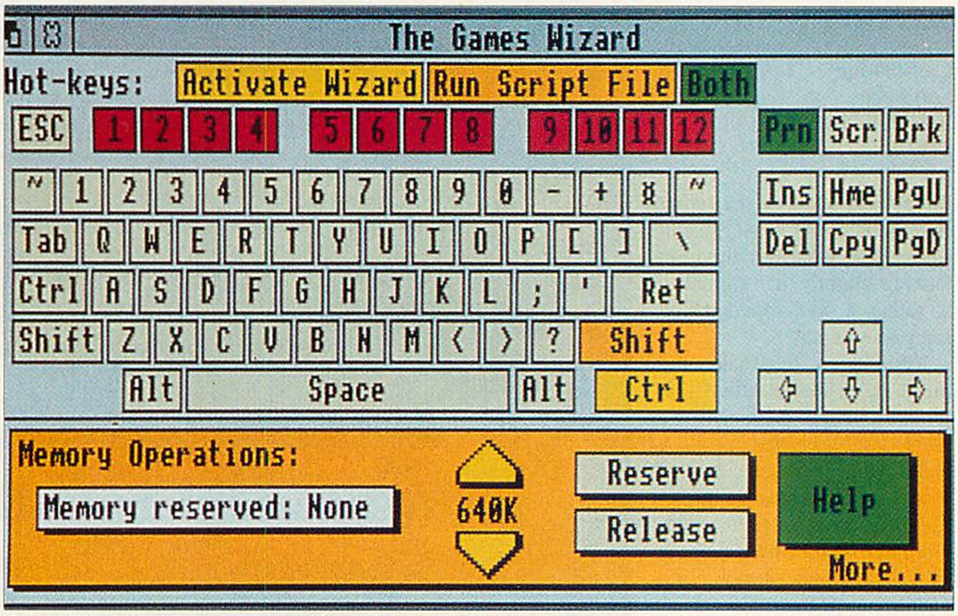
Next month we are waiting for at least two 32-bit games about laser beams and mirrors. *Fred* from Software 42 is a puzzle game where you need to find pieces of mirror to reflect and refract the laser beam all over the place in order to win, while Cambridge International Software has an almost identical theme in the pipeline.

CHEATS APPEAL

Do you know of any built in cheats for games in the Acorn world? Or have you devised some cunning routines for cheating in games which don't have secret passwords built in? If so, hesitate not! Send them to: Game Show, BBC Acorn User, 101 Bayham Street, London NW1 0AG.

THE GAMES WIZARD

Leading Edge
Tel: (0532) 621111
£29.99 + VAT



Games Wizard lets you intervene while a game is actually running . . .

Once upon a time there were some little children who didn't play out in the streets like the other boys and girls but stayed indoors and played games on their computer.

While the children in the street kicked a football round or played 'pretend' bare-knuckle boxing the ones inside sat pushing buttons to destroy aliens, race cars or discover ancient amulets in strange kingdoms. Some even unlocked the secrets of the universe. But – outside or in – they all had one thing in common: they all cheated if they possibly could.

And today, the situation is broadly speaking the same: by fair means or foul children usually get what they want. So, reasoned Leading Edge, why not accept this inherent characteristic of human nature and flog a piece of software that opens the door of dishonesty to virtually every game?

Let that 'naughty but nice' feeling get the better of you and be introduced to *The Games Wizard*, a utility that probes around the inner mechanics of games software and sorts out your lives, energy, time or score from your elbow.

Games Wizard works in two ways. By far the easiest is if the favourite game you want to cheat at happens to be one of the *Wizard* author's favourites too, because then the cheat will already exist as a 'script' file on the disc. Script files include much of the Krisalis repertoire, such as *Lemmings* and *Gods*, and several popular games like *Pacmania* and *Elite*, but not enough of the Fourth Dimension catalogue.

Games Wizard loads onto the desktop icon bar and the script file loads into it. Then you decide a combination of hotkeys using the keyboard diagram on screen which *Wizard* will use to activate the cheat once the game is running, and then you load the game.

Finally, the cheat will be effectual once the hotkey combination is pressed. In *Lemmings*, whenever the hotkeys are pressed it gives you 50 of each lemming-job and in *James Pond* the clock countdown is wound down nicely to give you more time. For most games the cheat is simply to increase the amount of lives.



. . . so that you locate the secrets of the Gods

But *Wizard* is more sophisticated than that. If the 25-odd cheats provided don't do much for your games collection the *Wizard* has the answer: it will scan through any game while you play and locate the place in the computer where the amount of lives or the time limit is stored, then change them for the better. It's like a private investigator, tracking down particular bytes to an address.

The easiest way to find the location in memory where the lives are held is to search for the number '3', go back into the game and lose a life, then return to *Wizard* and search for '2'. This hopefully narrows it down to three or four address locations, which you note down, and then 'poke' – assign a new value to the address; '10', for example.

To find passwords, *Wizard* allows you to search for a string (of letters), so you could search for one password that you know and then hope the others are stored in nearby address locations.

Another strategy is to enter *Wizard* from your game and ask it to memorise the current state of the *whole* computer, then re-enter the game and lose a life, spend a token, or whatever and finally ask it to compare the new state of the computer's memory with the old one for changes. This is good for finding the memory location of things like power-ups, which don't have any particular value associated with them as lives do.

Games Wizard can also slow the furious action of some games down so that people like my mum can play them, though it does make things a little jerky.

Leading Edge is careful to bill the software largely on the strength of its script files, saying that the more technical scanning features are available only to those who want to use them. It says in the manual that everyone who finds cheats using the system should send them to Leading Edge so they can pool them and make script files for everyone else's use.

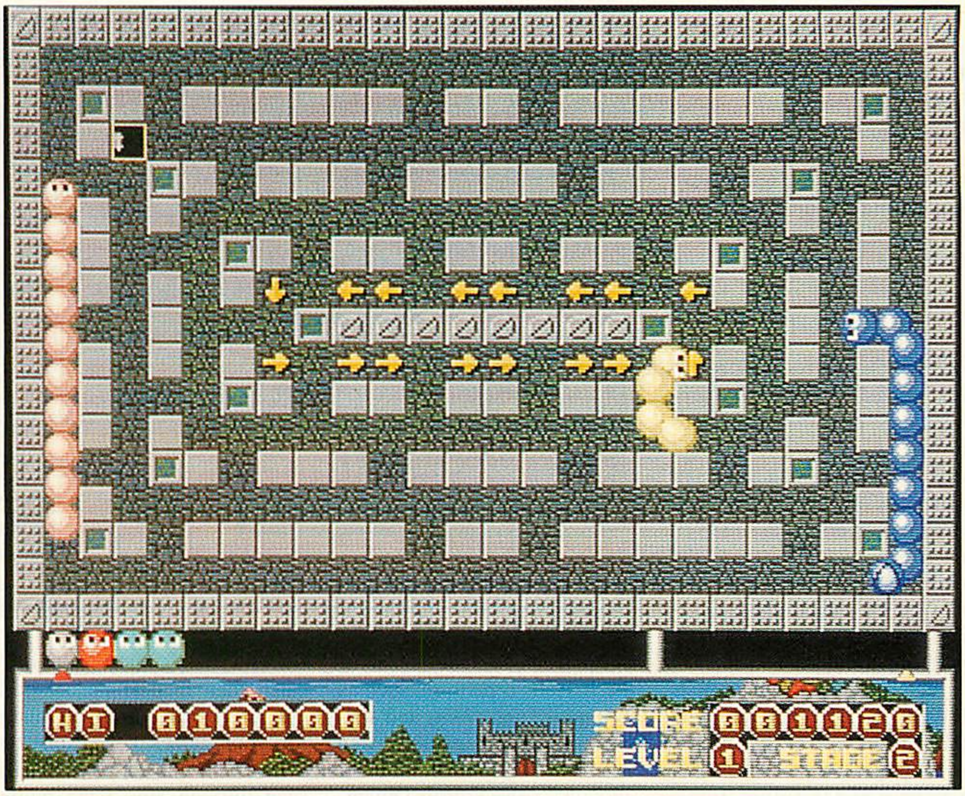
At the end of the day *Games Wizard* is quite impressive in the success it achieves: games writers are notorious for coding in incredibly strange ways – they usually need to in order to make the game fast – and the *Wizard* is crafty in the way it can still root out the cheats. But nevertheless, there will always be games that elude it and, despite numerous counter-measures built into *Wizard*, it could never be perfect.

If you like cheating, get yourself a copy, but if you want to use the advanced features be prepared to find yourself a little baffled, that's my advice.

Sam Greenhill

SERPENTS

Cambridge International Software
Tel: 071-226 3340
£19.95



Serpents is all a matter of snake eat snake

I won't expound on the rather ridiculous plot, what I will say is that *Serpents*, although lacking slightly in originality is rather a well-rounded and fun game to play.

You, Zippy the snake, are made up of body sections that follow your head, what's more you've been put in a maze which you have to coil your way around, cannibalistically disposing of other more evil snakes by biting the back of their heads and chomping off their tails.

The bigger you get (your body grows when you have a little nibble) the more powerful you get, and you can begin to confront bad snakes head to head, size yourself up first though, because if he has had more nosh, and therefore has more tail than you, then you're going to meet his intestines pretty quickly.

To clear a level, of which there are 40, you simply have to chomp all of the other snakes, before they chomp you. Helping you along are various little bonus squares, whose use become more and more obvious as you play the game again and again. Some baddies lay eggs, from which hatch little turbo powered young 'uns. Chomping on the egg before it hatches give you an extra section, but when the young escape then you've got a rather sticky problem.

Movement of Zippy around the maze is difficult at first, you often miss the passage that you want to go down, and end up in a dead end. The baddies mostly go at the same speed as you, although that can be remedied by popping a little speed pill.

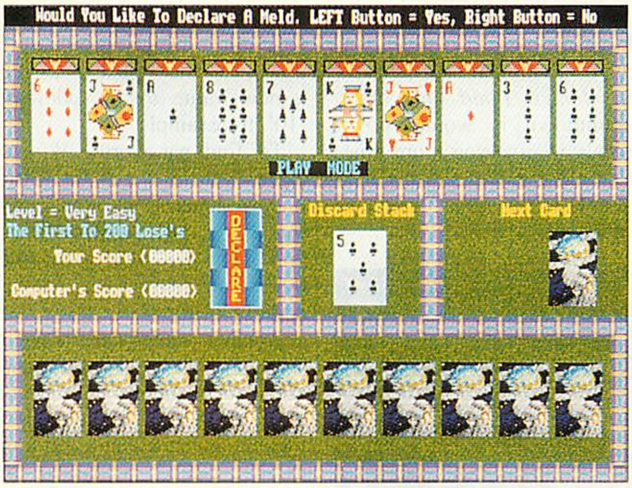
Initially you can't turn back on yourself, but another bonus token allows you to run back over your own tail; dead useful.

Good sound effects, pleasing graphics and a funky tune between levels means that *Serpents*, though not a block-buster, should nevertheless end up on your software shelf. It also installs on your hard disc, though it sometimes would not let me go back to the desktop.

Paul James

CARD-MANIA

Cambridge International Software
Tel: 071-226 3340
£19.95



Nothing wrong with BAU's colour printing: it really looks like this . . .

It's refreshing to run into a card game program that isn't bridge, pontoon or poker. *Card-mania* is a mini-compendium of three games, none of which have been, to my knowledge, done on the Arc before: gin rummy; cribbage and clock patience.

Clock patience – unlike the cult game with which we are all familiar, because it comes with Risc OS – is a proper two-deck patience where the exercise of skill is a major factor. Cribbage is a game that lends itself peculiarly well to computing. It's a two-player game, the object of which is to spot certain scoring combinations in your cards. Since the computer is pretty good at picking up scoring combinations, it often does rather well at this.

Finally, although we all know what rummy is, this gin rummy isn't real Hollywood-type gin, originally a game beloved of the likes of Humphrey Bogart, since that has a much more elaborate scoring structure that affects the player's strategic approach to the game. No matter, this plays passably well.

Unfortunately for *Card-Mania*, it possesses the least stylish graphics I've ever seen in a card-game program. It actually hurts the brain to look at a *Card-Mania* screen. I suggest that all users should search out the card sprites directory and redesign them straight away.

Card–Mania is a likeable, if somewhat quirky, program. But at twenty quid, I also feel that a large element of downsizing pricewise might have been in order.

Gordon Davis

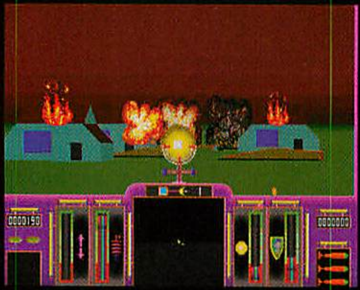
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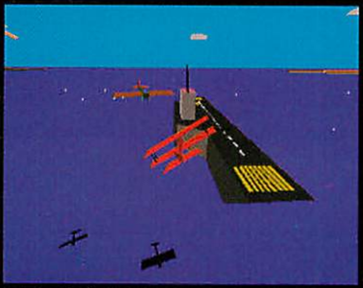
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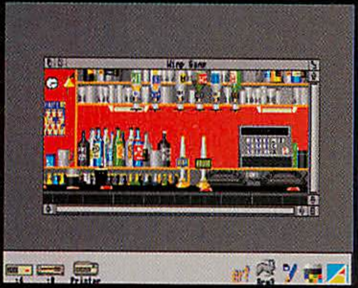
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QUESTIONS AND ANSWERS

Q Having recently purchased an A5000 Learning Curve, I plan to use it as a store for my A level chemistry and biology notes. My main requirements are for large areas of text interspersed with simple diagrams and occasional graphs. Easy cross-referencing of related topics would be an added bonus.

Which applications would best serve my purpose in terms of both the LC packages and others I might purchase?

S. Baker
London SE15

A The A5000 is fairly well-endowed when it comes to hard disc capacity but I would question the wisdom of using it as an information store per se. It's surprising how quickly you can fill up 80Mb just storing text on it.

Why not write up your notes on computer and then store them on paper (gasp!) for quick reference, keeping copies of completed documents on well-organised floppies. These could be annotated at a later date and summarised when revision time comes around.

On the software front, between Risc OS 3 and the Learning Curve, you already have a word processor for generating text (*1st Word Plus*), a vector drawing package for your diagrams (*Draw*), and a desktop publisher to stick them together (*Acorn DTP*).

If that's not enough to be getting on with, shop around for a good graphical spreadsheet (for example, Longman Logotron's *Eureka*, Colton Software's *Pipedream*). If your choice has reasonable data-sort facilities, it may also suffice as a simple database for indexing your work. If you want, you could also consider a copy of Icon Technology's *TechWriter* for those really snazzy formulae!

Q I recently bought a BBC Master Compact and can't get it to work properly. On switch-on, the screen says Acorn MOS and then, two lines lower, 'Acorn ADFS' with the cursor flashing on the next line. The Caps Lock and Shift Lock LEDs come on, but none of the alphanumeric keys work. If I press CTRL-BREAK, the screen clears and the same thing happens. What's going wrong? Where can I get an instruction book?

E.F. Jones
Gillingham

A The computer is waiting for you to put a 3.5in ADFS disc in its disc drive. If you have one (the Welcome disc which came with the machine, for example), stick it in the drive and your machine should come up with the > prompt. You are now ready to go.

If you don't have any 3.5in discs, you'll have to buy one (which should be double-sided double-density) in which case the machine will give you a disc error. After this you will need to format the disc.

This gets you over the first problem but there's a bit more to learn yet and, without some source of advice, you could soon get stuck again. As the Compact has been out of production for some time, I doubt if you'll find any new introductory books on the machine, so try looking around for something secondhand.

Ideally, you want a Master Compact Welcome Guide, but the Master 128 version would be almost as good. Try your local Acorn dealer, computer clubs, schools and colleges in your area. If you can't get something on the Master, ageing introductory guides to the original BBC micro can be found in most public libraries, and even these will help you get started.

Q Please can you help me get into the programs that I receive with my subscription disc each month? With the September *BAU* disc, when I attempted to load *Druid*, the computer told me: 'No run action specified for this file' and *Wizalon* responded with 'Code runs too low'. I don't understand what this means. Could you enlighten me?

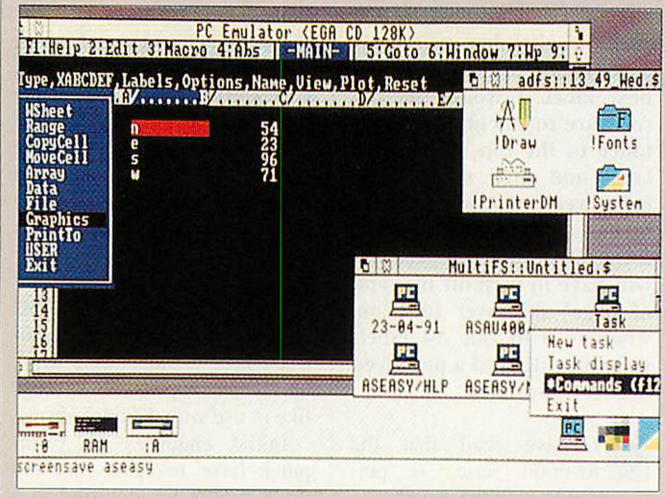
Mary Mason-Elliot
Redlynch, Wilts

STAR QUESTION

Q I, like many other Acorn users, bought my A3000 to augment my son's education, entertain my family and assist in my work. All three of these objectives have been parrly attained, but business still causes some frustration. My company does not use Acorn computers, so work I do at home cannot be regurgitated in the office unless I use the PC emulator.

You often make reference to the slowness of the machine when in emulation mode. Not being a connoisseur, will I really notice this when running *Lotus 1-2-3*? The emulator instruction manual suggests that *1-2-3* v.2.1 will run successfully. Will version 3.0 work? If it won't, is there any part of *1-2-3* version 3.0 that I need not load so that I can still have a Basic but usable spreadsheet that will run on both platforms?

Martin Osborne
Winchester



A I haven't seen *Lotus 1-2-3* v3.0 running on an Arc but, as versions 1.6 and higher of the PC Emulator will even run Microsoft Windows 3.0, it probably works. I'm not sure I'd recommend it. It is sad but true that when you try to persuade one computer to impersonate another, performance plummets, which becomes more apparent as you try to run more demanding software. These days, most MS-Dos programs are written on the assumption that users have a hard disc and more than the original Dos maximum memory of 640K. One of the reasons why *Lotus 1-2-3* version 2 is still sold alongside version 3 and *1-2-3* for Windows, is that it runs better on 'computationally challenged' PCs. As the emulator itself takes a certain amount of memory, I doubt if either version will run with less than 2Mb of RAM in your A3000.

If you have sufficient memory, take a look at a PC spreadsheet called *As-Easy-As* (geddit?) This program is 'remarkably similar' in look and feel to *1-2-3* v.2.2 (screen shot, above) and uses an identical disc format (.WKS) which 3.0 accepts for import and export. Using it on a 4Mb A310 with Arm2, there is a mild sensation of typing into porridge but it runs at an acceptable speed as long as you turn off the automatic re-calculation when working on large spreadsheets. *As-Easy-As* is available on 30-day approval from most PC shareware outlets for the little more than the price of a disc and, if you like it, registration is about £45.

A **I think you're using a Risc OS computer as opposed to a Beeb of some sort. This being the case, your problems arise because you are trying to run BBC assembly code on an Arc.**

BAU **programs are aimed at two families of Acorn computers called 'eight-bit' and '32-bit'. BBC Bs, B+s, Master 128s, Master Compacts and Electrons all use variants of the Motorola 6502, known as an 'eight-bit' microprocessor, whereas Archimedes, A300s, A3000s, A4000s and so on are all designed around 32-bit Arm2, 2.5 or 3 units.**

Because some eight-bit computers, like the Compact, use 3.5in format, ***BAU*** **discs contain both types of software, even though many eight-bit programs will not run on 32-bit machines and vice versa. Those BBC programs that will run on the Arc are usually included in a 32-bit subdirectory along with a** ***ReadMe*** **file telling you how to run them.**

To check which programs will run on your computer, consult the table at the beginning of each month's yellow pages.

Q I am having some trouble printing labels using outline fonts. The labels I am using are 3.5in by 2in, and what I want to do is define the text I wish to print and then set the page length to 2in, so that once the text has been printed the print head will move to the top of the next label.

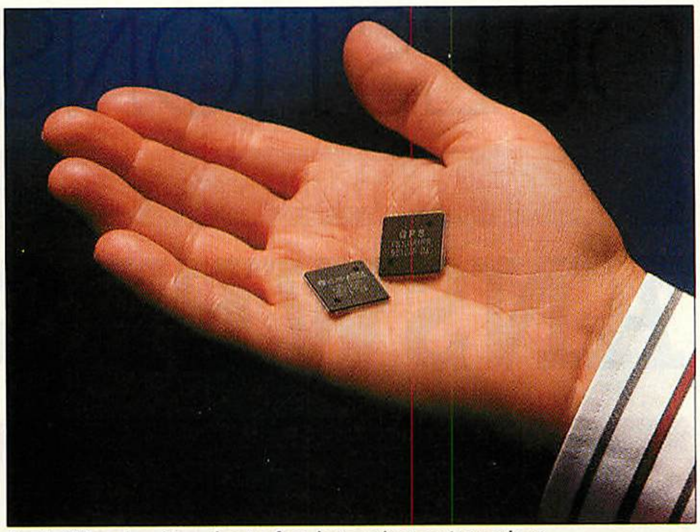
I have tried using SYS "PDriver_SetPageSize", but no matter how small I make the page length, the printer always ejects the page as if it were A4. Can you help?

Philip Beckett
Wisbech, Cambs

A **You don't say what sort of printer you are using, so I can't give a precise answer but I have an idea.**

Given that the page length you want is so short, it's possible that other lengths defined in the printer driver add up to more than your desired total. For example, if you had a 1in top margin, a 1in bottom margin and a 1in skip-over for continuous paper, you would end up with a total of 3in of defined blank space on a 2in page. Faced with such paradoxical instructions, many printers give up and throw out a page at the default paper size.

You could make your program send escape sequences that minimise these 'edge effects', but it might be easier to abandon page feeds as a means of getting to the next label. I would get the software to calculate the distance to the top of the next label and then move there using vertical tabs or incremental line feeds. If you are using continuous paper, you will have to turn off the 'end of page' skip-over function, whereas with flat A4 labels you will still need a page feed between sheets.



Arm's 600 series chips; they're fast, but we just can't use them

Q I have read that the Arm600 series is pin-compatible with the Arm2.

So, if I were to take out the Arm2 in my 1Mb A3000, replace it with an Arm6, exchange Risc OS 2 for Risc OS 3, change the internal memory to 12MHz and change the clock chip to 30MHz or so, would the computer still work?

Niall Douglas
Kerry Pike, Cork, Eire

A **I sincerely doubt it. Arm6 is not a chip but a 'microcell'; a processing element for a larger design. and, although the Arm61 is pin-compatible with Arm2, raising the whole board to 20MHz operation would be a major challenge, assuming it's even possible. On an A3000, almost all the components you cite are surface-mounted and, while your soldering skills may be up to removing and replacing hard-wired CPU packages, mine certainly aren't.**

Arm600 series chips, to date, are aimed at portable systems like Apple's Newton PDA. They are not CPUs for the next generation of Arcs. No doubt faster Risc OS CPUs will turn up in time but whether they'll be Arm600s, 700s or 800s, or whether they'll install on existing machines, only time will tell. In a nutshell, don't do it!

Q I have a series 7 BBC micro with a Hitachi 80-track double-sided disc drive unit which, if possible, I would like to use with 40-track discs.

Initial enquiries to Computek have revealed that my drive cannot be modified to a 40/80 switchable, and calls to Watford Electronics and Beebug regarding software double-stepping have proved negative. Can you help me? I doubt if I would use such a facility very often, so a cheap alternative would be preferred.

R. Dennis
Sheffield

A **If Beebug, Computek and Watford are all unable to help you, and 70 quid for a 40/80 switchable drive doesn't fall within your definition of 'cheap', then it's unlikely that there is a software solution available.**

This is unsurprising as, in general, the DFS merely sends stuff to standard 40 or 80-track devices, and leaves the drive electronics to control the mechanics of writing data to the disc.

Try getting in touch with your nearest computer club to see if someone will let you use their switchable drive to copy your 40-track discs on to 80-track. Local libraries often keep information on local clubs and societies.

Q I need help with Basic programming on my A3000. A few months ago, you had an article called 'Absolute Beginner' which was very helpful but I can't quite get it to take. I typed in the *Triangles* program, making sure I got the right number of spaces but it doesn't work. I think my problem is something to do with spaces but I don't know what. Can you help me so that I can get on with typing up something from your yellow pages?

Andrew Deakin (age 14)
Alton, Hants

A **Assuming you followed the rest of Sarah's advice about 'O's and '0's, case-sensitivity, bogus lines and opening and closing brackets, you may very well have a problem with spaces, but perhaps you have too many rather than too few.**

In Basic, you can use almost as many spaces as you like between commands. The one thing you can't do is use a space to break a command into two. For example, the instruction MODE 2 selects screen mode two, whereas MO DE 2 will generate a 'syntax error'. What is less obvious is that in Basic commands which use brackets e.g. RND( ), TAB( ), INKEY( ), the opening bracket is actually part of the command therefore if you type RND(7) as RND (7) you will get an error.

I suspect that, in your zeal to get the right number of spaces in, you may have created one or two of these. Keep trying, all programmers go through these frustrating experiences when they're starting out. Just keep telling yourself: 'computers are stupid'. It works. Trust me.

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ACORN USER ADVERTISEMENT PAGES MARCH 1993

£15 STAR LETTER

I found Stephen King's analysis of the future of the Archimedes (August 92, *BBC Acorn User*) to be very accurate and perceptive. The Arc can no longer rely on its raw processing power to compete with PCs, Macs and Unix. While relying on its current strengths, some new actions are required to maintain its long-term viability as more than an education machine.

Since the original BBC micro, Acorn hardware has always been rather expensive when compared to the opposition, enough to persuade many less commited computer buyers to choose an inferior product. Yet although it is limited by the smaller hardware base, Archimedes software is normally of excellent quality and at a very competitive price, even in comparison with PC shareware. But while there are gaps in the software portfolio for the Arc, users will again be tempted to choose an alternative.

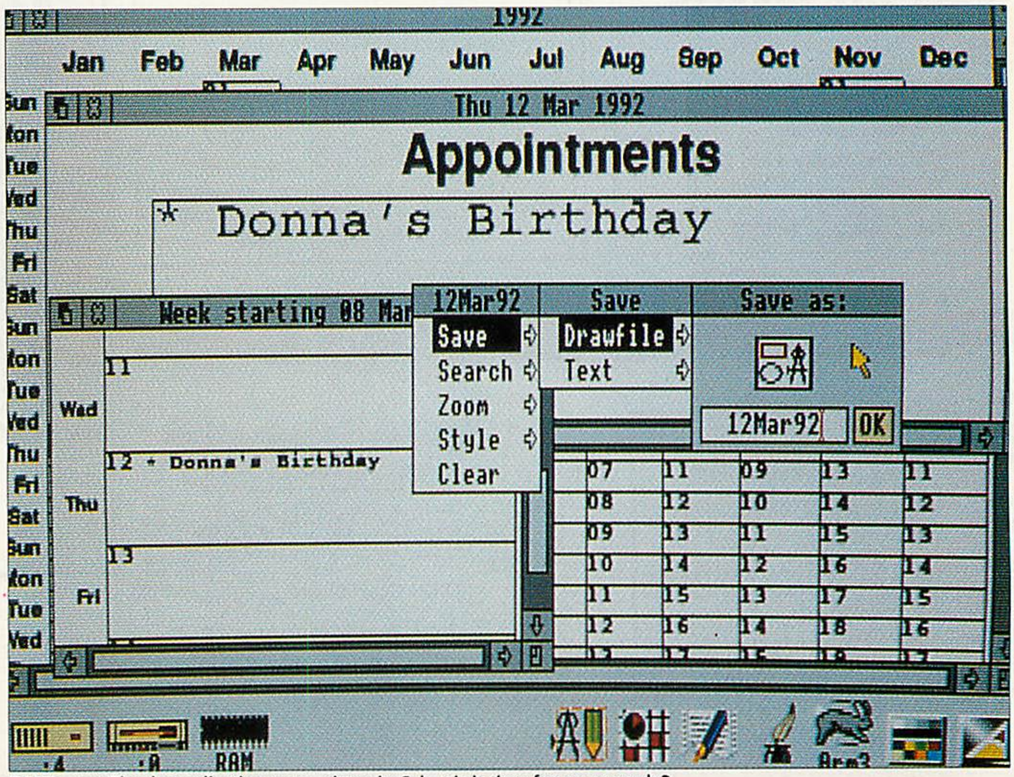
For instance, the Archimedes C compiler has enabled software to be ported from a number of other systems and is an outstanding product, both in terms of the code generated and the tools provided in Desktop C.

However, development on other machines is not standing still. A large proportion of current development now uses object-oriented techniques and the C++ language, particularly where a windows interface is required. The lack of a C++ compiler for the Arc could soon become a deterrent to software development, and especially by porting.

C++ could provide simple class library interfaces to Risc OS facilities. And a Wimp interface class library would be even easier to use than the current C Wimp library.

Steve Perkins
Manchester

Acorn are currently looking at CFront 3.0; the standard on many Unix systems. It is, however, still in the development stages, and not available for general use.



BAU's own Timely application was written in C; but is it time for an upgrade?

HEAD'S HEADACHE

As the head of IT at my school, I have been pleased with the suite of Risc OS machines we have been using this term. I do however, have a few niggles. Is there any way of reconfiguring Risc OS 3 so that the *Apps* folder does not appear on power up?

I get somewhat frustrated when the little angels at school can find the *Configure* program so easily. Also under Risc OS 3, many operations, including printing, require a *Scrap* directory to be set. This means that my program discs cannot be write protected, which again means that certain little darlings do nasty things to my program discs.

I do not want to ban pupils from unrestricted use of the computers, but neither do I want to waste my time making endless back-ups. These are all relatively minor problems, but they do add up to giving pupils a negative experience of these excellent machines. The problems above are foreseeable and will no doubt be addressed in the future. Meanwhile; any suggestions, anybody?

Ralph Edwards
Cheltenham

WISHFUL THINKING

I read with interest your article, Face the Music, in the February 1993 issue. As someone who is interested in the musical capabilities of my A3000, my wish is for a software package which, like the bundled *Maestro*, or the *Rhapsody* and *Notate* applications, has musical notation for input but outputs *Tracker/Soundtracker* type files.

Any *Tracker* writing software I have seen uses its own and – to me at least – user-unfriendly methods of entering data, which takes me ages to comprehend and rarely produces the results I want.

An ideal utility would convert the aforementioned programs' formats into *Tracker/Soundtracker* files.

Perhaps someone out there is willing to write a conversion utility or produce a *Soundtracker* writing package that is designed for those of us whose knowledge of music is greater than our knowledge of computing, do not have the cash to use Midi and would like to use the versatility of the *Tracker* formats.

Brian Howlett
Inverness

Although we cannot recommend a conversion program, you may be interested in a new release called *Digital Symphony*. The application is used to edit standard *Tracker* files, but it can also display tracks in a format similar to traditional stave notation. *Digital Symphony* will be reviewed in next month's *BAU*.

NEW RISCS

I recently upgraded to Risc OS 3.1 and have been disappointed by the lack of compatibility with the software I already own. Luckily, much of the educational software we use comes from Sherston Software which provides upgrades at no extra cost. But some other companies expect payments of between £5 and £10 to upgrade to a working copy. I hope you print this letter as a warning to other users.

Paul Divall
Bath

Next month we begin a special *BAU* series on Risc OS 3. Send your compatibility problems, or any other queries, to Risc OS 3, BBC Acorn User, Redwood Publishing, London NW1 OAG.

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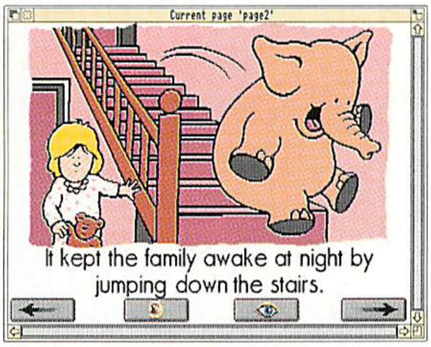
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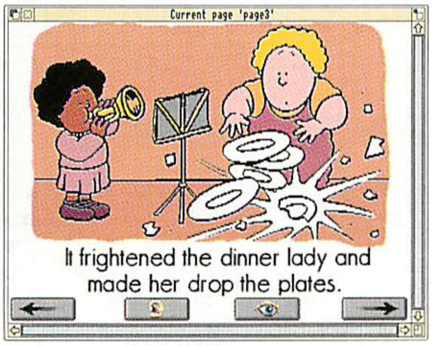
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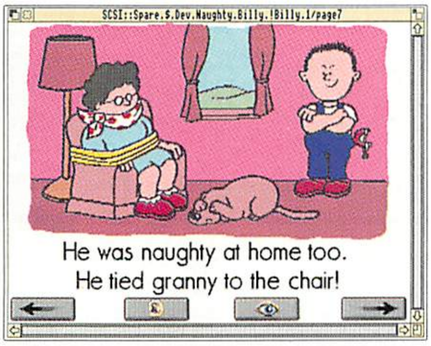
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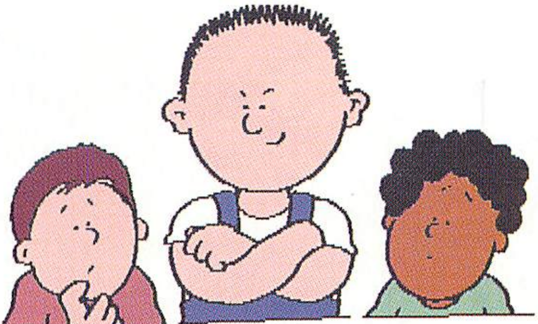
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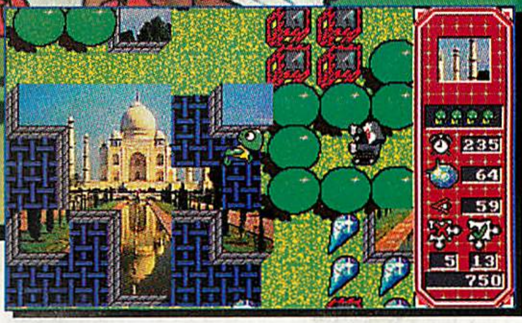
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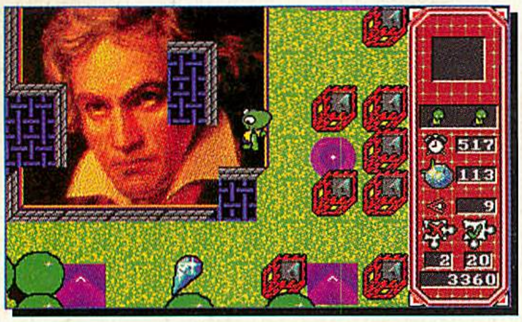
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